

BRIMAR

VALVE AND TELEPIPE MANUAL N° 9



PRICE SIX SHILLINGS

CONTENTS

INTRODUCTION

The No. 9 edition of the Brimar Valve and Teletube Manual has been revised to include details of additions to the ranges of products since the previous publication. A number of types has also been added to make the "Maintenance" categories as comprehensive as possible.

One hundred and seventy five "Current Equipment" and "Maintenance" valve types are detailed in addition to twelve teletubes. A summarised list of obsolete and obsolescent valve and teletube types, showing base connections, applications and brief characteristics is given at the end of the Valve/Teletube Section.

Details are also shown of the Brimar Twin Panel Teletubes and particulars are given of the different types of Bonded Shields which are available.

Particular attention is drawn to the new Design Data Service, provided at an annual subscription of £1, details of which are given on Page 8.

The "Direct Replacement" table gives Brimar equivalents to other manufacturers' valve types and refers in each case to the Manual page number on which the valve data may be found.

The CV equivalents lists have been expanded and brought up to date.

In the "Circuits Section" a number of revisions has been made and new circuits for audio and F.M. applications have been added.

The right is reserved to make any alterations to the data in this Manual without prior notice.

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PREFERRED TYPES FOR NEW EQUIPMENT

CLASSIFICATION		MINIATURE B7G & B9A		OCTALS	
		V _G	I _G	V _B	I _B
COLD CATHODE TUBES	Voltage Regulator	OA2	—		
		OB2	—		
DIODES	Efficiency	PY88	3.0	0.3	
	E.H.T. Rectifier	R10	2.0	0.15	
TRIODES	Multi-purpose	6C4	6.3	0.15	
	U.H.F. Oscillator	6AF4A	6.3	0.225	
BEAM TETRODES AND PENTODES	Grounded-grid	6AM4	6.3	0.225	
	E.H.T. Regulator			6BN4	6.3 0.2
R.F. Power	5763 *	6.0	0.75	6146	6.3 1.25
		6.3	0.6		
	5870	12.6	0.3		
	12AC6	12.6	0.15		
	12BL4	12.6	0.15		
	EF89	6.3	0.2		
	6BAE *	6.3	0.3		
	6BJ6	6.3	0.15		
	EF85	6.3	0.3		
	EF183	6.3	0.3		
R.F. Vari-Mu	Above 5 mA/V	9D7	6.3	0.3	
R.F. Straight 0.5 mA/V	6AU6	6.3	0.3		
	6BH6	6.3	0.15		
R.F. Straight above 5 mA/V	6AM8 *	6.3	0.3		
	6BW7	6.3	0.3		
	6CH6 *	6.3	0.75		
	6870	12.6	0.3		
	6885	6.3	0.3		
	EF80	6.3	0.3		
	EF184	6.3	0.3		
A.F. Power Output	6BW6 *	6.3	0.45		
	7D11	6.3	1.8		
	EL84	6.3	0.76		
Line Output	PL81	21.5	0.3	PL36	25 0.3
Field Output	PL84	15	0.3		
Video Output	6BW7	6.3	0.3		
	6CH6 *	6.3	0.75		
	6870	6.3	0.3		
	EF80	12.6	0.3		
A.F. Amplifier	6BS7	6.3	0.15		
	EF86	6.3	0.2		
HEPTODES	6BE6 *	6.3	0.3		
	12AD6	12.6	0.15		
Gating	7032	6.3	0.3		

CLASSIFICATION		MINIATURE B7G & B9A		OCTALS	
		V _G	I _G	V _B	I _B
DOUBLE DIODES	Directly heated rectifier				
	Indirectly heated rectifier	4X4 *	6.3	0.6	
DOUBLE TRIODES		EZ80	6.3	0.6	
		EZ81	6.3	1.0	
TRIODES	Multi-purpose	GZ34	5.0	1.9	
		6ALS *	6.3	0.3	
DIODE TRIODES	R.F. (Cathode, zener, grounded grid)	6BQ7A	6.3	0.4	
		EC195	6.3	0.435	
TRIODE PENTODES		EC188	6.3	0.365	
		ECC189	6.3	0.365	
DOUBLE PENTODES		PC189	7.2	0.3	
TRIODE HEPTODES	Multi-purpose	12AT7 *	6.3	0.3	
		12AU7 *	12.6	0.15	
VALVES	Time Base & Pulse	12BH7	6.3	0.6	
			12.6	0.3	
VALVES	DC amplifier	13D1 *	6.3	0.6	
			12.6	0.3	
VALVES	Computer	5985	6.3	0.45	
			12.6	0.225	
VALVES	Series regulator	EB8CC	6.3	0.3	
VALVES	Double diodes	6AT6	6.3	0.3	
		12AE6	12.6	0.15	
VALVES	Triple diodes	EABC80	6.3	0.45	
VALVES	Audio	ABR8	6.3	0.45	
		ECL82	6.3	0.70	
VALVES		ECL86	6.3	0.7	
		PCL86	14.5	0.3	
VALVES	Field time base	PCL85	18	0.3	
VALVES	Video or LF	IBD1	9.45	0.3	
		ECF80	6.3	0.43	
VALVES		ECF804	6.3	0.45	
		PCF86	9.0	0.3	
VALVES		PCL84	15	0.3	
VALVES	Frequency changer	ECF90	6.3	0.43	
		PCF80	9.0	0.3	
VALVES		PCF86	9.0	0.3	
VALVES	A.F. Power Output	ELL80	6.3	0.55	
VALVES	Frequency changer	ECH81	6.3	0.3	

*Special Quality Equivalent Available.

PREFERRED TYPES FOR NEW EQUIPMENT — APPLICATIONS

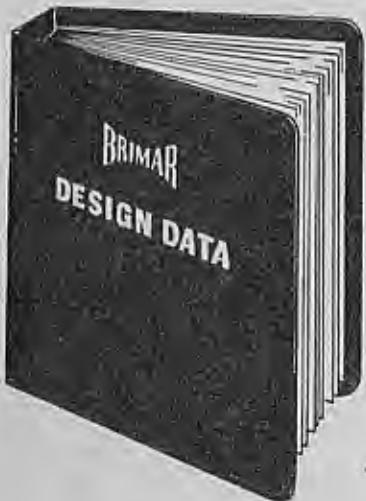
A.M. and F.M. Receivers	Audio	Television Receivers	Car Radios	Mobile and Communications	Industrial and Computer	Amateur
Grounded Grid, R.F. and Self-Oscillating Mixer for Band II ECC85	Low Noise Pentode EF86	Cascode R.F. Amplifier PCC89 ECC189	12 volt H.T. Range	Grounded Grid, Amplifier Triode 6AM4	Double Diode 6ALS *	Cascode R.F. Amplifiers 6BQ7A ECC88
Triode Heptode Frequency Changer (A.M.) and Amplifier (F.M.) ECH81	Double Triodes I2AX7 I2AU7 I2BH7	Triode Pentode Frequency Changer PCF86 PCF80 ECF80	Vari-Mu Pentode I2AC6 I2BL6	U.H.F. Oscillator Triode 6AF4A	Low Interface Computer Double Triode 5965	Grounded Grid, Amplifier Triode 6AM4
Straight R.F. Pentode 6BH6 EF80	Triode Pentodes 6BR8 ECL82 ECL86	I.F. Amplifier 6BW7 EF184 EF80	Heptode Frequency Changer I2AD6	Cascode V.H.F. Amplifier 6BQ7A ECC88	Pulse and Time-Base Double Triode I2BH7	U.H.F. Oscillator Triode 6AF4A
Vari-Mu R.F. Pentodes 6BA6 6BJ6 9D7	Output Pentodes EL84 6BW6 ELL80	Vari-Mu I.F. Amplifier 9D7 EF183	Double Diode Triode I2AE6	R.F. Power Amplifier 5763 * 6BW6 * 6146	D.C. Amplifier 13D3 *	Triode Pentode Frequency Changer ECP80
	Rectifiers EZ80 EZ81 6X4 5U4G GZ34	Double Diode 6ALS	Vibrator operated Triode Heptode Frequency Changer ECH81	A.F. Power Amplifier 6BW6 * 7DII	Low Noise A.F. Pentodes EF86 6BS7	R.F. Power Amplifiers 6870 6CH6 * 5763 * 6146 6BW6 *

Double Diode 6ALS	Level Indicator EM84	Sync Amplifier and Separators Time Base Oscillators I2AT7 I2AU7 PCF80	Heptode Frequency Changers 6BE6 I2BE6	Double Diode 6ALS *	Voltage Regulators OA2 OB2	A.F. Power Amplifiers 6BW6 * EL84 6146 7DII
Triple Diode Triode EABC80		Field Oscillator and Output PCL85	Vari-Mu Pentodes 6BA6 I2BA6 6BJ6	Heptode Frequency Changer 6BE6 *	Thyratron 2D21	Low Noise A.F. Pentode EF86
Double Diode Triode 6AT6				Wide Band Amplifier Pentode 6688 R.F. Amplifier EF183	Rectifiers 5R4GY 5U4G GZ34	Rectifiers 5R4GY 5U4G GZ34
Tuning Indicator EM84		Field Output PL84	High Slope Pentodes 6BH6 I2AU6		Video Output Pentode 6870 6CH6 *	Voltage Regulators OA2 OB2
Output Pentode EL84 ELL80		Line Output PL81 PL36	Double Diode Triodes 6AT6 I2AT6		R.F. Power Amplifiers 6870 6CH6 * 5763 * 6BW6 * 6146	
Triode Pentode ECL82 ECL86		Booster Diode PY88				
Rectifiers EZ80 EZ81 6X4		Audio PCL82 PCL86				
		EHT EY86 R20				

* Special Quality Equivalent available

BRIMAR

DESIGN DATA SERVICE



A new loose leaf valve data service which supersedes the Brimar Application Report Service, has been inaugurated to enable design engineers to keep up to date with the latest information on current Brimar Valve types.

Data on new types will be supplied in three stages:

- (a) During development of the valve Preliminary Data will be issued, giving basic details of the type.
- (b) Following this, Final Data will be issued giving complete characteristics and curves associated with the type.
- (c) A further section giving circuit and application data will be issued on certain types where necessary.

A subscription of £1 per annum is charged for the Brimar Design Data Service which can be obtained by applying to the Publicity Department, Brimar Commercial Division, Thorn-AEI Radio Valves and Tubes Limited, Footscray, Kent, or to the Brimar Valve Application Laboratory, Rochester, Kent.

A list of reports issued under the former "Application Report Service" is given below:

6AK6	6BQ7A	6CD6G	I2AU7	EL84/6BQ5
6AM6	6BR7	6CH6	I2AX7	ELL80
6AT6	6BR8	6U4GT	I3D3	EM840
6AV6	6BS7	6X4	50C5	EZ80/6V4
6AU6	6BS7 (add.)	8D8	807	PCL84
6BA6	6BW6/9BW6	I2AH8	5763	R17
6BE6	6BW7	I2AT7	ECF82/PCF82	R18
				CV List

and these can be obtained free of charge on application.

VALVE RATINGS

GENERAL: The following notes have been compiled to assist equipment designers in determining satisfactory operating conditions for the valves in their equipment. The recommendations below are based largely on the British Standard Code of Practice CP 1005 entitled "The Use of Electronic Valves", to which the user is referred for fuller information. The recommendations are necessarily of a general nature and should be interpreted accordingly. Where specific recommendations are published in the data relating to a particular valve, these should always be followed.

RATINGS: Ratings may be defined as values which establish either limiting capabilities or limiting conditions for an electron device. They are determined for specified values of environment and operation, and may be stated in any suitable terms. Limiting conditions may be either maxima or minima.

Ratings cannot be considered as barriers on one side of which satisfactory operation is obtained, while on the other side immediate failure will occur. The expectation of life decreases continuously as the maximum ratings are approached, particularly with respect to bulb temperature. Exceeding the rating accelerates this decline. With a few exceptions, the more conservative the use of the valve with respect to limiting ratings, the greater is the life expectancy and reliability. Ratings in the Brimar No. 9 Manual are based on either the "Absolute Maximum" system or the "Design Centre" system. The two systems are defined below. Unless otherwise specified, the ratings published are "Design Centre" ratings.

ABSOLUTE MAXIMUM RATINGS: Absolute maximum ratings are limiting values of operating and environmental conditions applicable to any electron device of a specified type as defined by its published data, and should not be exceeded under the worst probable conditions.

These values are chosen by the device manufacturer to provide acceptable serviceability of the device, taking no responsibility for equipment variations, environmental variations and the effects of changes in operating conditions due to variations in the characteristics of the device under consideration, and of all other devices in the equipment.

The equipment manufacturer should design so that initially and throughout life no absolute maximum value for the intended service is exceeded with any device under the worst probable operating conditions with respect to supply-voltage variation, equipment component variation, equipment control adjustment, load variations, signal variations, environmental conditions and variations in characteristics of the device under consideration, and of all other devices in the equipment.

DESIGN CENTRE RATINGS: Design Centre Ratings are limiting values of operating and environmental conditions applicable to a bogey electron device of a specified type as defined by its published data and should not be exceeded under normal conditions.

These values are chosen by the device manufacturer to provide acceptable serviceability of the device in average applications, taking responsibility for normal changes in operating conditions due to rated supply-voltage variation, equipment component variation, equipment control adjustment, load variation, signal variation, environmental conditions and variations in the characteristics of all electron devices.

The equipment manufacturer should design so that initially no design-centre value for the intended service is exceeded with a bogey device in equipment operating at the stated normal supply voltage.

N.B.—A bogey electron device is an electron device whose characteristics have the published nominal values for the type. A bogey electron device for any particular application can be obtained by considering only those characteristics which are directly related to the application.

HEATER AND FILAMENT SUPPLIES: Valves are designed to operate with a specified heater or filament voltage or current, and will give optimum life and performance when operated under the specified conditions. Deliberate over- or under-running of heaters or filaments to obtain apparently desirable characteristics is to be deprecated.

Valves operated in parallel from a transformer will give satisfactory operation if the voltages on the heaters or filaments are within $\pm 5\%$ of the rated value when the mains supply voltage is at its declared value, provided that the mains voltage does not deviate from this value by more than $\pm 10\%$.

In the case of valve heaters connected in series with a controlling resistance, the current should be within $\pm 2\%$ of the rated value at the declared mains supply voltage, and with valves having nominal heater voltage drop, provided that the mains voltage does not vary by more than $\pm 10\%$ from its nominal value.

Car radio valves are designed to give satisfactory performance over the range of voltages encountered in operation from a battery of lead-acid cells connected to a charger. The normal range of variation is from 1.8 to 2.5 volts per cell, with short-term fluctuations up to 2.7 volts per cell.

1.4 volt battery valves are designed for a mean voltage of 1.3 volts, which is the approximate mean voltage of a dry cell over its useful life. These valves will operate satisfactorily over the range 1.1 to 1.5 volts. If they are operated with their filaments connected in series, the anode and screen currents will return to the negative HT terminal through the filament chain, and in general the current in each filament will be different, unless the appropriate filaments are shunted by a suitable resistor to by-pass the additional current. It is recommended that this practice be followed to equalise the voltage drops across the filaments.

Where variations of heater or filament supplies outside the recommended limits can not be avoided, it will usually be necessary to apply reduced ratings to the valves.

HEATER-CATHODE INSULATION: The heater-cathode rating, unless otherwise qualified, shall be interpreted as the maximum instantaneous value of combined alternating and steady voltage, either positive or negative in respect of the cathode. The maximum potential difference between heater and cathode should be kept as low as possible, and should not exceed 250 volts, except where otherwise specified.

The insulation resistance between heater and cathode should not be included in R.F. circuits where frequency stability or preservation of waveform is important or in A.F. circuits followed by high gain.

Transformer windings supplying heaters should not be left "floating". Where no D.C. connection between the winding and the cathode exists, a resistor of the order of 100 k Ω should be connected between the heater and the cathode.

A valve should not be rendered inoperative by opening the cathode circuit unless there is a resistor not exceeding 250 k Ω connected between heater and cathode.

CATHODE CIRCUIT: Valves should not be run for long periods with the cathode hot, but with no cathode emission, unless it is specified in the data that the valve is suitable for this class of service.

CONTROL-GRID CIRCUIT: The resistance between the control grid and cathode should be kept as low as possible, and published data should be consulted for limiting values. For most small receiving valves, unless otherwise specified, the resistance should not exceed 1 M Ω with auto-bias, and 0.5 M Ω with fixed

bias. Certain types of small receiving valves, such as some R.F. amplifiers, may employ values up to 3.5 M Ω with auto-bias. In general the value used with receiving valves having anode dissipations in excess of 10 watts should not be greater than 0.5 M Ω with auto-bias, and 0.1 M Ω with fixed bias, unless otherwise specified. If the resistance is common to more than one control grid circuit its value should be reduced proportionately.

Valves should not be used in applications which result in appreciable grid current unless such conditions are specified in the published data.

When valves are operated at low values of grid bias, grid current will flow, damping the input circuit, unless the bias exceeds the contact potential, which will vary somewhat with individual samples and with life.

It is undesirable that grid bias should be provided solely by grid rectification, unless the circuit is designed so as to prevent damage to the valve in the event of loss of drive.

Valves having very high values of mutual conductance are sensitive to small variations of grid bias and auto-bias should be used in preference to fixed bias. The stability of D.C. operating conditions may be increased by using a positive bias on the grid, in conjunction with a suitably increased value of cathode bias resistor.

SCREEN GRID CIRCUIT: The source resistance of the screen voltage supply should be kept as low as practicable, and for most applications a potential divider network, or other voltage source having good regulation, is preferred to a series resistor. This is particularly applicable to pentodes having aligned grids, and to unaligned tetrodes, where the screen current is subject to relatively wide variation with operating conditions and between individual valves. In the case of pentodes with unaligned grids, the variation is smaller, and series resistors may be used.

Where variable grid bias is applied to control gain, the use of a high impedance supply to the screen will result in the lengthening of the grid base.

At low anode voltages the screen current tends to increase greatly, and care is required to avoid exceeding the screen dissipation. The anode voltage should not be removed while the screen is energised.

SUPPRESSOR GRID CIRCUIT: The suppressor grid should normally be connected to the cathode, although in certain applications connection to the negative end of the cathode bias resistor or to the A.G.C. line is permissible. If negative bias is applied to the suppressor, care is required to ensure that the screen dissipation is not exceeded. Unless the published data includes suppressor grid characteristics, it is unwise to place any reliance on the uniformity of this parameter. Resistance in series with the suppressor grid should be avoided, unless conditions involving the use of such resistance are specified in the published data.

Valves should not be operated in conditions which result in appreciable suppressor grid current, unless such operation is indicated in the published data. Where pentodes are connected as triodes, the suppressor grid should be connected to the cathode, unless otherwise specified.

MOUNTING AND VENTILATION: The mounting position of most modern indirectly heated valves is unrestricted. If directly heated types are mounted horizontally, the plane of the filament should be vertical. Due attention should be paid to the effect of the mounting position on ventilation and cooling.

The pins of small glass based valves should be protected by pin protectors, but where this precaution has not been followed, the pins should be straightened in a pin-straightener before the valve is inserted in a socket. The connecting wires to valveholders having floating contacts should be as flexible as possible, and wiring jigs should be employed while the connections are being made.

Where valves are used with printed circuits the design of the sockets should be such as to ensure that after assembly the insertion and withdrawal forces are within the limits encountered with normal chassis mounting sockets. These limits are defined in British Standard BS448.

The use of spare socket contacts as wiring supports is not recommended, and on no account should any connection be made to pins marked I.C.

Flying lead valves are usually secured in position by the envelope. Any clamps used for this purpose should be of high thermal capacity and conductivity and should make intimate contact with the envelope over as large an area as possible. Well-designed clamps of this type may substantially improve the cooling of the valve with consequent increase of life expectancy and reliability. The leads of valves of this type should not be bent sharply close to the glass, and care is required in making soldered connections to avoid overheating the seals. In the case of miniature and sub-miniature types, the wire should not be soldered closer than 3 mm to the glass, and a thermal shunt between the point of soldering and the glass seal should be employed during the operation.

The presence of strong electromagnetic or electrostatic fields is liable to affect the performance of valves, which should be positioned or screened so as to avoid such effects.

Ventilation and layout of equipment should be such as to ensure a safe bulb temperature under all conditions. Unless otherwise specified the maximum temperature of the hottest part of the bulb under operating conditions should not exceed by more than 20°C the temperature which would be obtained if the valve were operated at its maximum rating in conditions of free air circulation at an ambient temperature of 20°C.

To allow free radiation of heat from a valve, surrounding surfaces should not be polished, and should be as cool as possible. The inner and outer surfaces of screening cans should be matt blackened, and adequate ventilation holes should be provided at the top and bottom.

The use of screening cans which are not in thermal contact with the envelope may seriously interfere with the cooling of the valve, and the use of screening cans of high thermal capacity and conductivity in intimate thermal contact with the envelope is to be preferred, particularly with valves which tend to approach the limiting bulb temperature. The thermal capacity of screening cans is usually increased by the use of the chassis as a "heat sink", and careful consideration must be given to the question of cooling where no metallic chassis exists, as in the case of equipment using printed circuits.

Valves should not be mounted adjacent to components running at very high temperatures.

CROSS COUPLING: A certain amount of cross coupling may exist between the sections of multi-unit valves, and it should not be assumed that such valves will give satisfactory performance in applications other than those specified, even if the characteristics of the individual units are satisfactory for the proposed application.

RECTIFIER RATINGS: A new system of rating has been used for the current equipment types of rectifiers in the Brimar No. 9 Manual. Reference to these charts enables the valve to be used at maximum efficiency within its ratings over a wide range of operating conditions. There are three rating charts for each rectifier and additional information is published in the form of characteristic curves for typical operating conditions within the limits imposed by the charts.

Charts I, II and III are applicable to operation with a Capacitor Input Filter, and for certain types, limiting conditions for Choke Input Filter operation are also shown on Chart I. For choke input operation, the point G on Chart I indicates the maximum permissible open circuit anode supply voltage, and the boundary A B C D G defines the maximum permissible rectified current at any specified anode supply voltage. There is a limiting minimum value of input choke at any specified values of supply voltage and load current below which satisfactory operation will not be obtained. Minimum choke lines are drawn on the appropriate characteristic curves, and for a particular value of choke the curves are valid only in the region to the right of the appropriate choke line. For capacitor input operation, the area of permissible operation is defined on Chart I by the Boundary A E D G, but reference must also be made to Charts II

and III which define the conditions limiting the steady state peak anode current, and peak surge current (under hot-switching conditions), to their rated values.

Use of the charts and curves proceeds as follows. For a circuit with a choke input filter, the operating conditions must be chosen to lie within the appropriate boundary on Chart I, and the minimum choke value may be calculated, or read from the characteristic curves. The latter make no allowance for the voltage drop in the supply transformer nor in the choke, due to their resistance. This voltage drop may be taken as the product of the mean rectified current and the effective circuit resistance.

In the case of a capacitor input filter, reference is first made to Chart III to determine the minimum value of peak surge current limiting resistor which may be used with the specified supply voltage. The D.C. output voltage must then be determined under the specified conditions of supply voltage and load current, either experimentally or by reference to the characteristic curves. The rectification efficiency is calculated from the expression:—

$$\text{Rectification Efficiency} = \frac{V_o}{E_v/2}$$

Where V_o = D.C. output voltage

E_v = R.M.S. Supply voltage per anode.

It is then ascertained whether the rectification efficiency lies within the limit imposed by Chart II at the specified current. If the limit is exceeded the series resistance in each anode must be increased. The values of series resistance chosen in compiling the characteristic curves for capacitor input filter operation are such as to satisfy the conditions imposed by Chart II at the maximum permitted value of rectified current. Where a design calls for a lower value of current, the rectification efficiency may be increased by reducing the value of the series resistor, provided that it is still greater than the minimum value specified by Chart III.

The value of series resistance chosen to satisfy the conditions imposed by Charts II and III will restrict the peak steady state and peak surge currents to the permitted values irrespective of the value of the reservoir capacitor and there is consequently no upper limit to the value of the capacitor which may be used.

Where hot-switching is likely to occur frequently, it is recommended that choke input operation should be used.

The series resistance per anode includes any resistance inherent in the circuit such as the total effective resistance of the transformer windings. The total effective transformer resistance R_t is given by $R_t = n^2 R_p + R_s$ where R_p is the primary resistance, R_s the secondary resistance, and n is the ratio of the secondary turns to the primary turns. The number of secondary turns is that of the proportion of the secondary winding supplying each anode, i.e. for a full wave circuit, half of the total secondary winding.

Base Connection Symbols

Symbols used in this Manual are based on British Standard Specification No. 1409.

ELECTRODE SYMBOLS

a = anode.	f = filament.
a ₁ , a ₂ etc., = anode 1, anode 2 etc.	k = cathode.
bp = beam plates.	t = fluorescent target.
g = grid.	s = internal shield.
g ₁ , g ₂ etc. = grid 1, grid 2 etc.	M = external metallizing.
h = heater.	

VALVE SYMBOLS

The following symbols are used to distinguish between two or more sections in the same valve:-
 d = diode. h = hexode or heptode. p = pentode.
 q = tetrode. r = rectifier. t = triode.

Example g_{2h} = 2nd grid of the hexode section.
 The following symbols are used to distinguish between similar electrodes in two or more sections in the same valve.

Example:

a' = anode of Section 1 g_1' = grid 1 of Section 1
 a'' = " " 2 g_1'' = " 1 " 2

OTHER SYMBOLS

*IC = internal connection. NP = no pin. SC = side contact.
 NC = no connection. J = jumper. TC = top contact.
 *Pin marked IC—in no circumstances should this pin be employed. The valve maker is at liberty to make any internal connection to pins so labelled.

ADDITIONS TO VALVE AND TELETUBE RANGES

The following types included, some new, others to extend the "Maintenance" range, are given for the first time in this issue of the Brimar Valve and Teletube Manual.

BRIMAR VALVES

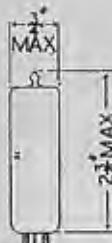
7D11	EBC81	ECH81	EF183	EM85
12BL6	EBF89	ECL83	EF184	GZ34
18D2	ECC88	ECL86	EF804	PCC85
6080	ECC189	EF85	ELL80	PCC89
DY86	ECF804	EF86	EM81	PCF86
PCL83	PY82	UBF89	UF80	
PCL85	PY88	UCC85	UF89	
PCL86	R20	UCH81	UL84	
PL82	UABC80	UCL82	UM80	
PY32	UBC81	UCL83	UY85	

TELETUBES

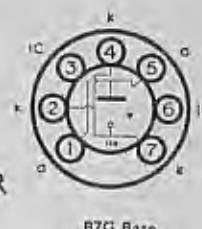
C17AF	C19AH*	C19AK/AW47-90*	C21AA
C21AF	C23AG*	C23AK/AW59-90*	

* Also available as TWIN PANEL TELETUBES

Current Equipment Type



TYPE 0A2
MINIATURE
VOLTAGE REGULATOR



CHARACTERISTICS

Maximum striking voltage	...	...	...	...	...	180 volts
Minimum applied supply voltage	...	...	...	...	...	185 volts
Maximum stabilising voltage at 30 mA	...	...	...	...	...	165 volts
Minimum stabilising voltage at 5 mA	...	...	...	...	...	142 volts
Nominal stabilising voltage	...	...	...	...	...	150 volts
D.C. operating current	...	...	...	...	...	5 to 30 mA
Maximum peak current (10 seconds max.)	...	...	...	...	...	75 mA
Nominal regulation, 5 to 30 mA	...	...	...	...	...	1 volt
Maximum regulation, 5 to 30 mA	...	...	...	...	...	6 volts
Nominal drift in stabilising voltage (100 to 1,000 hours)	...	...	...	...	...	2.9 volts
Temperature coefficient, -20 to +90°C.	...	...	...	...	...	±10 mV/°C.
Ambient temperature range	...	...	...	...	...	-55 to +90°C.

Type 0A2 is a commercial equivalent to the CV1832.

NOTE.—With suitable socket connections the internal connection between pins 1 and 5 acts as a switch to open the load circuit when the valve is removed.

Not less than the quoted minimum supply voltage should be provided to ensure starting during life.

Sufficient resistance must always be kept in series with this type to limit the current to 30 mA under steady state conditions. As stated, during the initial warming up period a maximum current of 75 mA is permissible providing that a period of several minutes duration of operation at normal current follows.

If the associated circuit has a capacitor in shunt with this valve it should be limited to 0.1μF. A larger value may cause oscillation and thus give unstable regulation.

Operation with reversed polarity will damage this valve.



Current Equipment Type

TYPE OB2
MINIATURE
VOLTAGE REGULATOR



CHARACTERISTICS

Maximum striking voltage	... ... ... ...	127 volts
Minimum applied supply voltage	... ... ... ...	133 volts
Maximum stabilising voltage at 30 mA	... ... ... ...	112 volts
Minimum stabilising voltage at 5 mA	... ... ... ...	105 volts
Nominal stabilising voltage	... ... ... ...	108 volts
D.C. operating current	... ... ... ...	5 to 30 mA
Maximum peak current (10 seconds max.)	... ... ... ...	75 mA
Nominal regulation, 5 to 30 mA	... ... ... ...	1.5 volts
Maximum regulation, 5 to 30 mA	... ... ... ...	3.5 volts
Nominal drift in stabilising voltage (100 to 1,000 hours)	... ...	1.4 volts
Temperature coefficient, -20 to +90°C.	... ...	±5 mV/°C.
Ambient temperature range	... ... ... ...	-55 to +90°C.

Type OB2 is a commercial equivalent to the CV1833.

NOTE.—With suitable socket connections the internal connection between pins 1 and 5 acts as a switch to open the load circuit when the valve is removed.

Not less than the quoted minimum supply voltage should be provided to ensure starting during life.

Sufficient resistance must always be kept in series with this type to limit the current to 30 mA under steady state conditions. As stated, during the initial warming up period a maximum current of 75 mA is permissible providing that a period of several minutes duration of operation at normal current follows.

If the associated circuit has a capacitor in shunt with this valve it should be limited to 0.1 μ F. A larger value may cause oscillation and thus give unstable regulation.

Operation with reversed polarity will damage this valve.

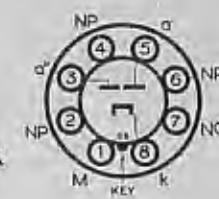
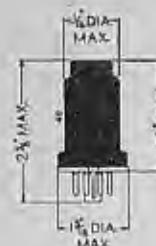
Maintenance Type

TYPE OZ4

(OCTAL BASE)

FULL-WAVE RECTIFIER

For Car Radio



OPERATING CHARACTERISTICS

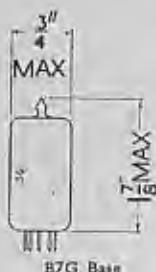
The BRIMAR type OZ4 is a full-wave gas filled rectifier with an ionic heated cathode, no external heater supply being required.

A minimum anode to cathode potential of 300 volts peak is necessary for consistent starting and this value increases somewhat during life.

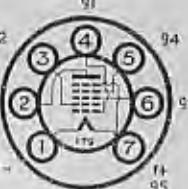
Type OZ4 is fitted with a metal shell which must be efficiently earthed to prevent the radiation of R.F. interference to other parts of the receiver.

(Heater supply—not required)

Starting Peak Voltage	... ... ... ...	300 volts min.
Peak Anode to Anode Voltage	... ... ... ...	1,000 volts max.
Peak Anode Current (each anode)	... ... ... ...	200 mA max.
D.C. Output Voltage	... ... ... ...	300 volts max.
D.C. Output Current	... ... ... ...	{ 30 mA min. 75 mA max.
Voltage Drop	... ... ... ...	24 volts



Maintenance Type
TYPE IAC6
MINIATURE BATTERY
HEPTODE FREQUENCY
CHANGER



The BRIMAR 1AC6 is a battery heptode frequency changer featuring improved short-wave performance and reduction in H.T. current consumption compared with type 1R5. The provision of separate connections for the oscillator anode and screen grid allow the use of conventional oscillator circuits and a much improved oscillator performance. As a self oscillating frequency changer it operates uniformly up to 30 Mc/s.

RATINGS

Filament Voltage ...	... 1.4 volts
Filament Current ...	... 0.05 amp.
Anode Voltage ...	... 90 volts max.
Screen (g_2) Voltage ...	... 90 volts max.
Oscillator Anode (g_3) Voltage ...	... 60 volts max.
Cathode Current ...	... 4 mA max.

OPERATING CHARACTERISTICS

Anode Voltage ...	... 85 volts
Anode Current ...	... 0.7 mA
Screen Voltage ...	... 60 volts
Screen Current ...	... 0.15 mA
Oscillator Anode Voltage	... 30 volts
Oscillator Anode Current	... 1.6 mA
Oscillator Grid Resistor *	... 27 k Ω
Oscillator Grid Current ...	... 115 μ A
Conversion Conductance	... 325 μ A/V
Control Grid Bias (For conversion of 3.25 μ A/V)	... -6 volts
Anode Impedance	... 0.65 meg.

* The oscillator grid resistor should be returned to the positive filament connection pin 7

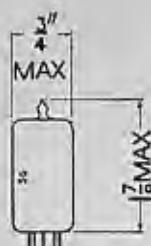
INTER-ELECTRODE CAPACITANCES
(with no external shield)

R.F. input (c_{gs} , all)	... 7.5 pF.
I.F. output (c_{gs} , all)	... 8.5 pF.
Oscillator Input (c_{gs} , all)	... 4.0 pF.
Oscillator Output (c_{gs} , all)	... 5.0 pF.
c_{gs} , g_1	... 0.2 pF. max.
c_{gs} , a	... 0.4 pF. max.

Maintenance Type

TYPE 1R5

MINIATURE
BATTERY HEPTODE
FREQUENCY CHANGER



BRIMAR type 1R5 is a miniature battery operated frequency changer particularly suitable for all-wave receivers. The control grid (g_2) has vari-mu characteristics and A.V.C. may be applied. When used in the recommended circuits type 1R5 has a high effective oscillator slope and will operate satisfactorily at frequencies up to 20 Mc/s. Its small size and low filament drain features are particularly applicable to compact lightweight equipment.

RATINGS

Filament Voltage ...	... 1.4 volts
Filament Current ...	... 0.05 amp.
Anode Voltage ...	... 90 volts max.
Screen (g_2 , g_1) Voltage ...	... 67.5 volts max.
Cathode Current ...	... 5.5 mA max.

OPERATING CHARACTERISTICS

Anode Voltage ...	... 45	90	90	volts
Anode Current ...	... 0.7	0.8	1.6	mA
Screen Voltage ...	... 45	45	67.5	volts
Screen Current ...	... 1.9	1.9	3.2	mA
Oscillator Grid (g_3) Resistor	... 0.1	0.1	0.1	meg.
Oscillator Grid Current ...	... 0.15	0.15	0.25	mA
Control Grid (g_2) Voltage	... 0	0	0	volts
Anode Impedance	... 0.6	0.8	0.6	meg.
Conversion Conductance	... 0.24	0.25	0.3	mA/V
Control Grid Bias ...	-9	-9	-14	volts

(For conversion conductance of 0.005 mA/V)

INTER-ELECTRODE CAPACITANCES *

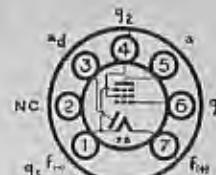
R.F. Input (Control Grid to all other electrodes)	... 7.0 pF
I.F. Output (Anode to all other electrodes)	... 7.0 pF
Oscillator Input (Oscillator Grid to other electrodes)	... 3.8 pF
Control Grid to Oscillator Grid	... 0.1 pF max.
Oscillator Grid to Anode	... 0.1 pF max.
Control Grid to Anode ...	... 0.4 pF max.

* With no external shield.

Type 1R5 is a commercial equivalent to the CV782.



Maintenance Type
TYPE 1S5
MINIATURE BATTERY
DIODE PENTODE



BRIMAR type 1S5 is one of the series of miniature battery valves introduced for portable radio equipment. It is designed for use as detector, A.V.C. and audio amplifier valve in superheterodyne receivers. Special care has been taken in the manufacture of type 1S5 to reduce noise and microphony to a low level.

RATINGS

Filament Voltage	...	...	...	...	...	1.4 volts
Filament Current	...	...	...	...	...	0.05 amp.
Anode Voltage	...	...	...	...	...	90 volts max.
Screen (g_2) Voltage	...	...	...	...	...	90 volts max.
Cathode Current	...	...	...	...	...	3.0 mA max.

CHARACTERISTICS

Anode Voltage	...	...	...	...	45	67.5 volts
Anode Current	...	...	...	...	0.75	1.6 mA
Screen Voltage	...	...	...	...	45	67.5 volts
Screen Current	...	...	...	...	0.18	0.4 mA
Control Grid (g_1) Voltage	...	...	...	...	0	0 volts *
Mutual Conductance	...	...	...	...	0.50	0.625 mA/V
Anode Impedance	...	...	...	...	1.0	0.6 meg.

RESISTANCE COUPLED OPERATION

Anode and Screen Supply Voltage	...	...	45	67.5	90	volts
Anode Load Resistor	...	...	1.0	1.0	1.0	meg.
Screen Series Resistor	...	...	1.9	2.2	2.5	meg.
Control Grid Resistor	...	...	10	10	10	meg. *
Peak Output	...	...	14	17	31	volts
Voltage gain	...	...	31	36	45	

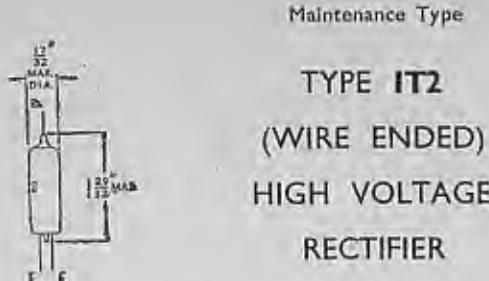
* Control grid return taken to negative filament (Pin 1).

INTER-ELECTRODE CAPACITANCES†

Input	...	...	...	...	...	...	2.2 pF.
Output	...	...	...	...	...	...	2.4 pF.
Control Grid to Anode	...	...	...	...	...	...	0.2 pF.
Diode to all other electrodes	...	...	...	...	...	...	3.0 pF.

† With no external shield.

Type 1S5 is a commercial equivalent to the CV784.



Maintenance Type
TYPE 1T2
(WIRE ENDED)
HIGH VOLTAGE
RECTIFIER

The BRIMAR type 1T2/R16 is a directly heated half-wave rectifier designed for use in the E.H.T. supply of television receivers.

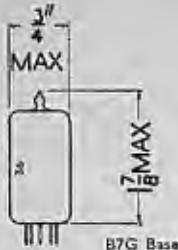
RATINGS

Filament Voltage	...	...	...	...	...	...	1.4 volts *
Filament Current	...	...	...	...	...	...	0.14 amp.
Peak Inverse Voltage	...	...	...	...	...	...	15 kV. max.
Peak Anode Current	...	...	...	...	...	...	12 mA max.
Direct Anode Current	2 mA max.

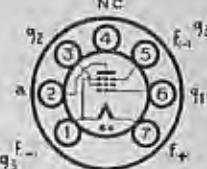
INTER-ELECTRODE CAPACITANCES

Anode to Filament ($C_{a,f}$)	0.65 pF
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* Correct filament operation is essential in order to secure long life. Filament-temperature during normal operation may be compared with that of a second valve running from a low frequency filament supply whose voltage can be accurately measured. At least 1 inch of leads should be allowed when soldering the valve into position to avoid damage to the glass seals.



Maintenance Type
TYPE IT4
MINIATURE VARI-MU
BATTERY R.F. PENTODE



BRIMAR type 1T4 is one of the series of miniature battery valves introduced for portable radio equipment. It is suitable for the R.F. or I.F. stages of receivers employing A.V.C. Type 1T4 is well screened internally and will function satisfactorily as a high gain amplifier in deaf aid or other audio apparatus.

RATINGS

Filament Voltage ...	...	...	...	...	...	...	1.4 volts
Filament Current ...	...	...	...	...	...	...	0.05 amp.
Anode Voltage ...	...	...	...	...	...	...	90 volts max.
Screen (g_2) Voltage	...	...	...	...	...	...	67.5 volts max.
Cathode Current ...	...	...	...	...	...	...	5.5 mA max.

CHARACTERISTICS

Anode Voltage ...	...	...	...	...	45	90	90 volts
Anode Current ...	...	...	...	...	1.7	1.8	3.5 mA
Screen Voltage ...	...	...	...	...	45	45	67.5 volts
Screen Current ...	...	...	...	...	0.7	0.65	1.4 mA
Control Grid (g_1) Voltage	...	...	...	...	0	0	0 volts*
Mutual Conductance ...	...	...	...	...	0.7	0.75	0.9 mA/V
Anode Impedance ...	...	...	...	...	0.35	0.8	0.5 meg.
Control Grid Bias ...	...	...	...	...	-10	-10	-16 volts

(for Mutual Conductance of 0.01 mA/V).

RESISTANCE COUPLED OPERATION

Anode and Screen Supply Voltages ...	...	...	45	67.5	90	volts
Anode Load Resistor ...	...	...	0.5	0.5	0.5	meg.
Screen Series Resistor ...	...	...	0.75	1.0	1.0	meg.
Control Grid Resistor ...	...	...	1.0	1.0	1.0	meg.*
Peak Output ...	...	...	7.5	15	20	volts
Voltage Gain ...	...	...	30	50	56	

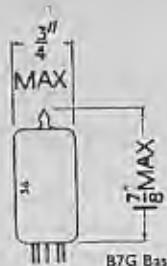
* Control grid return taken to negative filament (Pin 1).

INTER-ELECTRODE CAPACITANCES†

Input ...	...	...	...	...	...	...	3.6 pF.
Output ...	...	...	...	...	...	...	7.5 pF.
Control Grid to Anode ...	...	...	...	...	...	...	0.01 pF. max.

† With external shield connected to Pin 1.

Type 1T4 is a commercial equivalent to the CV785.



Maintenance Type
TYPE 1U5
GLASS BUTTON BASE
MINIATURE BATTERY
DIODE PENTODE



BRIMAR type 1U5 features low microphony and reduced feedback. The electrical characteristics are similar to those of type 1S5 but the new pin connections permit a more rugged structure and better internal shielding.

RATINGS

Filament Voltage ...	...	...	...	...	...	...	1.4 volts
Filament Current ...	...	...	...	...	...	...	0.05 amp.
Anode Voltage ...	...	...	...	...	...	...	90 volts max.
Screen (g_2) Voltage	...	...	...	...	...	...	90 volts max.
Cathode Current ...	...	...	...	...	...	...	4.5 mA max.

CHARACTERISTICS

Anode Voltage ...	...	...	...	45	67.5	volts
Anode Current ...	...	...	...	0.75	1.6	mA
Screen Voltage ...	...	...	...	45	67.5	volts
Screen Current ...	...	...	...	0.18	0.4	mA
Control Grid (g_1) Voltage	...	...	...	0	0	volts*
Mutual Conductance ...	...	...	...	0.50	0.625	mA/V
Anode Impedance ...	...	...	...	1.0	0.4	meg.

RESISTANCE COUPLED OPERATION

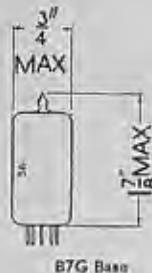
Anode and Screen Supply Voltage ...	...	...	45	67.5	90	volts
Anode Load Resistor ...	...	...	1.0	1.0	1.0	meg.
Screen Series Resistor ...	...	...	1.9	2.2	2.5	meg.
Control Grid Resistor ...	...	...	10	10	10	meg.*
Peak Output ...	...	...	14	17	31	volts
Voltage Gain ...	...	...	31	36	45	

* Control grid return taken to negative filament (Pin 1).

INTER-ELECTRODE CAPACITANCES†

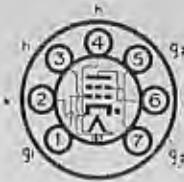
Input (Control Grid to all except Anode) ...	...	...	...	...	...	...	2.2 pF.
Output (Anode to all except Control Grid) ...	...	...	...	...	...	...	2.4 pF.
Grid to Diode Capacity ...	...	...	...	...	...	...	0.03 pF.
Grid to Anode Capacity ...	...	...	...	...	...	...	0.1 pF.

† With no external shield.



Current Equipment Type

TYPE 2D21
MINIATURE
HOT CATHODE
GAS FILLED
THYRATRON



Heater Voltage	...	...	...	...	...	...	6.3 volts
Heater Current	...	...	...	...	...	...	0.6 amp.
Cathode Heating Time	...	...	...	...	...	...	10 secs. min.
Peak Forward Anode Voltage	...	...	...	...	...	...	650 volts max.
Peak Inverse Voltage	...	...	...	...	...	...	1,300 volts max.
Peak Screen Grid Voltage before Conduction	...	...	...	...	...	...	-100 volts max.
†Average Screen Grid Voltage during Conduction	...	...	...	...	...	...	-10 volts max.
Peak Control Grid Voltage before Conduction	...	...	...	...	...	...	-100 volts max.
Peak Cathode Current	...	...	...	...	...	...	0.5 amp. max.
†Average Cathode Current	...	...	...	...	...	...	0.1 amp. max.
Surge Current (Duration 0.1 sec. max.)	...	...	...	...	...	...	10 amps. max.
†Average Screen Current	...	...	...	...	...	...	0.01 amp. max.
†Average Control Grid Current	...	...	...	...	...	...	0.01 amp. max.
Grid Circuit Resistance	...	...	...	...	...	...	10 MΩ max.
Peak Heater-Cathode Voltage, Heater Negative	...	...	...	...	...	...	100 volts max.
Peak Heater-Cathode Voltage, Heater Positive	...	...	...	...	...	...	25 volts max.
Ambient Temperature Range	...	...	...	...	...	...	-75°C. to 90°C.

† Averaged over any interval of 30 seconds.

OPERATING CHARACTERISTICS

Voltage Drop	...	...	...	...	...	...	8 volts approx.
Control Grid Control Ratio ($R_{g1} = 0\Omega$)	...	...	...	...	...	...	250 approx.
Screen Grid Control Ratio ($R_{g2} = 0\Omega$)	...	...	...	...	...	...	1,000 approx.

RELAY SERVICE

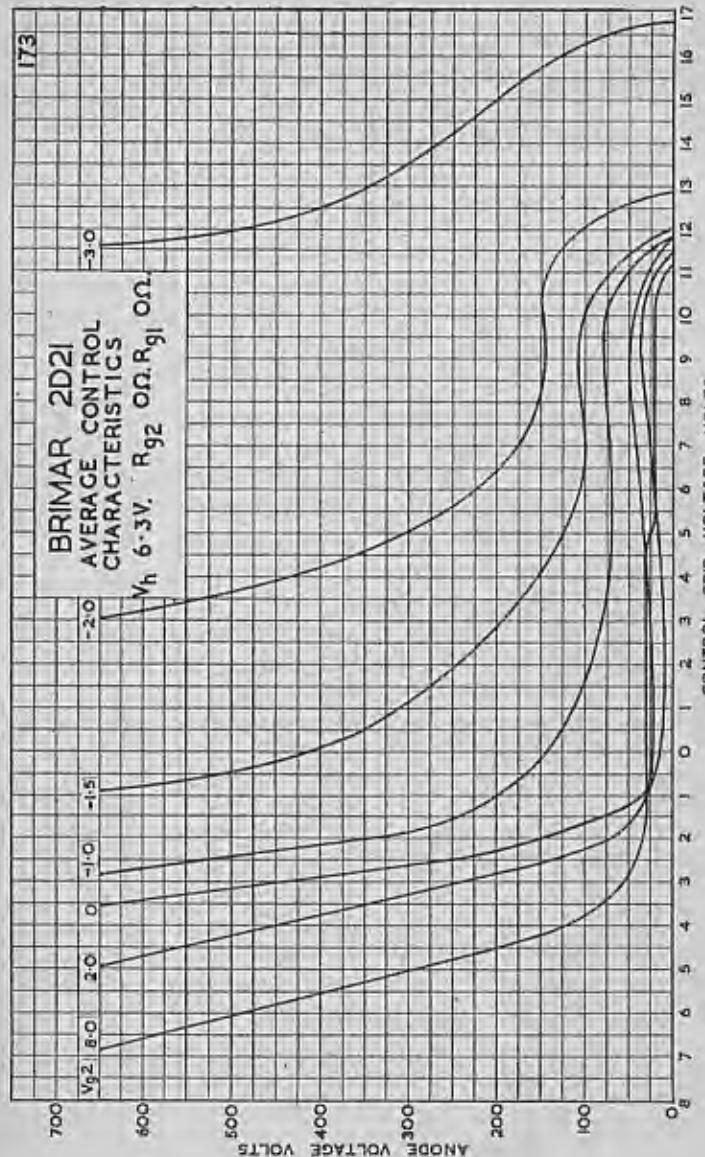
Anode Voltage	...	...	...	117	460	volts R.M.S.
Direct Screen Grid Voltage	...	...	...	0	0	volts
Control Grid Voltage (180° out of phase with Va)	...	...	...	5	—	volts R.M.S.
Direct Control Grid Voltage	...	...	...	—	—6	volts
Control Grid Signal Voltage	...	...	...	5	6	volts peak
Control Grid Circuit Resistance	...	...	...	1.0	1.0	MΩ
*Anode Circuit Resistance	...	...	...	1.2	2.0	kΩ

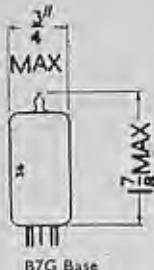
* Anode circuit resistance, including the valve load, must be sufficient to prevent the cathode current from exceeding the valve rating.

INTER-ELECTRODE CAPACITANCE

Grid to Anode	...	...	0.026 pF	Output	...	...	1.6 pF
Input	...	...	2.4 pF				

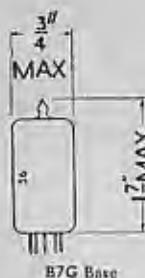
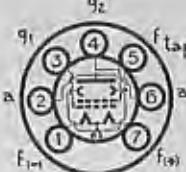
Type 2D21 is a commercial equivalent to the CV797.



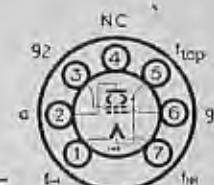


Maintenance Type

TYPE 3S4
MINIATURE BATTERY
OUTPUT BEAM TETRODE



Maintenance Type

TYPE 3V4**BATTERY****OUTPUT BEAM TETRODE****RATINGS**

	Parallel Filaments	Series Filaments†		
Filament Voltage ...	1.4	2.8		volts
Filament Current ...	0.1	0.05		amp.
Anode Voltage ...	90	90		volts max.
Screen (g ₂) Voltage ...	67.5	67.5		volts max.
Cathode Current (no signal) ...	9.0	4.5††		mA max.
Cathode Current (max. signal) ...	11.0	5.5††		mA max.

OPERATING CHARACTERISTICS

	Parallel Filaments	Series Filaments†			
Anode Voltage ...	67.5	90	67.5	90	volts
Anode Current ...	7.2	7.4	6.0	6.1	mA
Screen Voltage ...	67.5	67.5	67.5	67.5	volts
Screen Current ...	1.5	1.4	1.2	1.1	mA
Control Grid (g ₁) Voltage ...	-7.0	-7.0	-7.0	-7.0	volts*
Mutual Conductance ...	1.55	1.575	1.4	1.425	mA/V
Anode Impedance ...	0.1	0.1	0.1	0.1	meg.
Optimum Load ...	5,000	8,000	5,000	8,000	ohms
Power Output ...	0.18	0.27	0.16	0.235	watts
Harmonic Distortion ...	10	12	12	13	per cent

† For series operation of the sections, a shunting resistor must be connected across the section between Pins No. 1 and No. 5 to by-pass any cathode current in excess of the rated maximum per section. When other tubes in series-filament arrangement contribute to the filament current of the 354, an additional shunting resistor may be required between Pins No. 1 and No. 7.

†† Values are for each 1.4 volt section.

* Control grid volts measured from negative filament (Pin 5 in parallel connection, Pin 1 in series connection).

BRIMAR type 3V4 is an output valve for use in battery and A.C./D.C. Battery receivers where the H.T. supply is 90 volts. Compared with type 3S4 it features increased power sensitivity and reduced harmonic distortion.

RATINGS

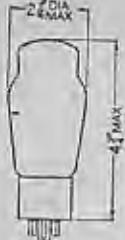
	Series Filaments†	Parallel Filaments	
Filament Voltage ...	2.8	1.4	volts
Filament Current ...	0.05	0.1	amp.
Anode Voltage ...	90	90	volts max.
Screen (g ₂) Voltage ...	90	90	volts max.
Cathode Current ...	6 *	12	mA max.

OPERATING CHARACTERISTICS

	Series Filaments†	Parallel Filaments	
Anode Voltage ...	90	90	volts
Anode Current ...	7.7	9.5	mA
Screen Voltage ...	90	90	volts
Screen Current ...	1.7	2.1	mA
Control Grid (g ₁) Voltage ...	-4.5	-4.5	volts
Mutual Conductance ...	2.0	2.15	mA/V
Anode Impedance ...	0.12	0.1	meg.
Optimum Load ...	10,000	10,000	ohms
Power Output ...	0.24	0.27	watts
Harmonic Distortion ...	7	7	per cent

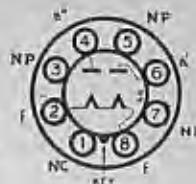
† For series operation of the sections, a shunting resistor must be connected across the section between Pins No. 1 and No. 5 to by-pass any cathode current in excess of the rated maximum per section. When other types in series-filament arrangement contribute to the filament current of the 3V4, an additional shunting resistor may be required between Pins No. 1 and No. 7.

* Values are for each 1.4 volt section.



Current Equipment Type

TYPE 5R4GY
(OCTAL BASE)
FULL-WAVE RECTIFIER



The BRIMAR type 5R4GY is a directly heated full wave rectifier for use in A.C. mains equipment where a large output is required.

Filament Voltage 5.0 volts Filament Current 2.0 amps.

RATINGS

Peak Inverse Voltage	... ...	2,800 volts max.
Peak Current (each Anode)	... ...	650 mA max.
Peak Surge Current	... ...	2.5 amps. max.
Anode Supply Voltage	... ...	— see Rating Chart
D.C. Output Current	... ...	— see Rating Chart

CHARACTERISTICS AS FULL-WAVE RECTIFIER

CAPACITOR INPUT:		CHOKE INPUT	
R.M.S. Input per Anode	... 750 volts	R.M.S. Input per Anode	... 1,000 volts
Rectified Current	... 250 mA	Rectified Current	... 175 mA
D.C. Output Voltage	... 620 volts	D.C. Output Voltage	... 870 volts
Supply Impedance per Anode	505 Ω	Minimum Filter Input	5 Henries
Reservoir capacitor	8 μF	Chokef	... ...

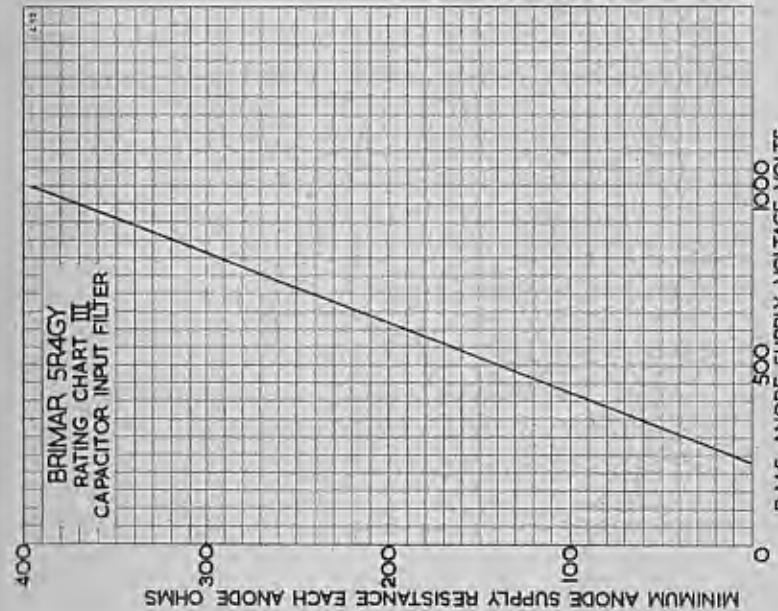
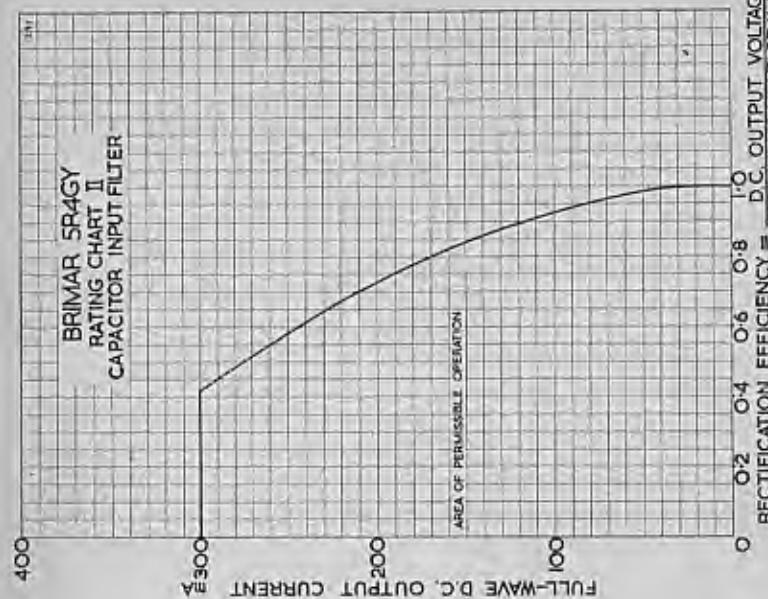
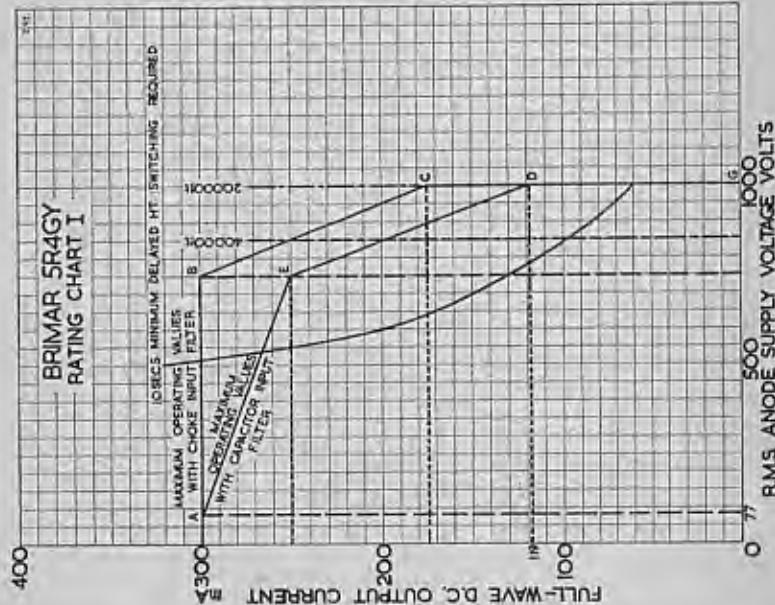
† Limiting value at 170 mA. For operating currents less than 170 mA refer to curve.

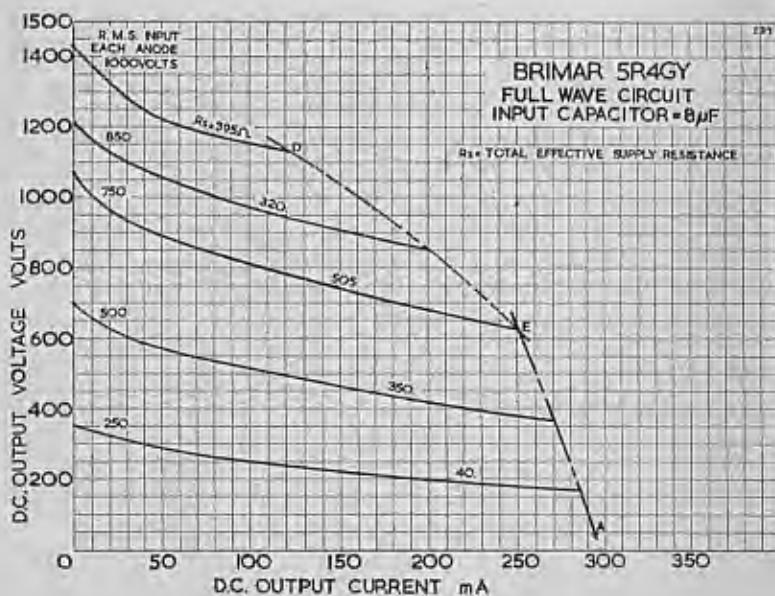
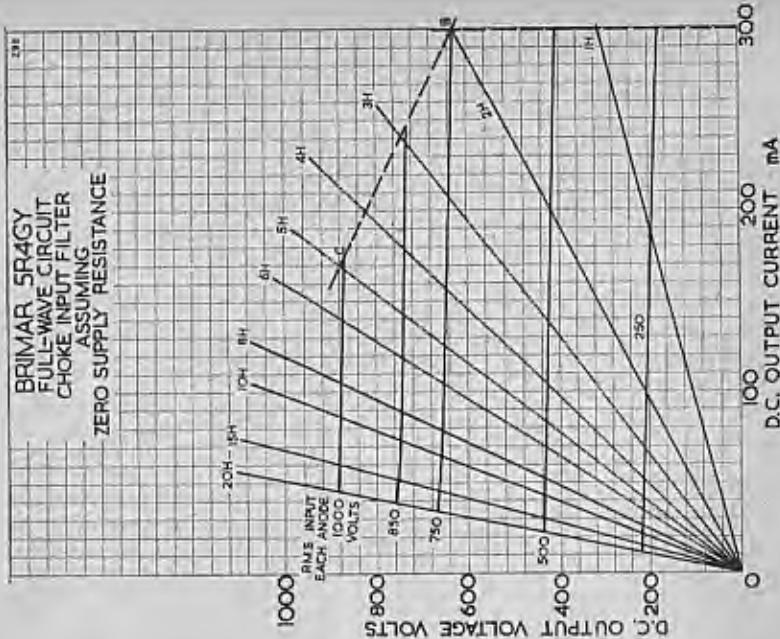
‡ Delayed switching of approx. 10 seconds MUST BE EMPLOYED when the following ratings are exceeded with Capacitor Input Filter.

550 volts R.M.S. at 250 mA D.C.
600 volts R.M.S. at 200 mA D.C.
650 volts R.M.S. at 175 mA D.C.

700 volts R.M.S. at 150 mA D.C.
800 volts R.M.S. at 115 mA D.C.
900 volts R.M.S. at 75 mA D.C.

For notes on use of rating charts, refer to "Valve Ratings" section.



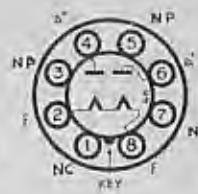


Current Equipment Type

TYPE 5U4G

(OCTAL BASE)

FULL-WAVE RECTIFIER



Filament Voltage 5.0 volts Filament Current 3.0 amps.

RATINGS

Peak Inverse Voltage	... ...	... ...	... ...	... ...	1,550 volts max.
Peak Current (each Anode)	... ...	... ...	... ...	... ...	675 mA max.
Peak Surge Current	... ...	... ...	... ...	... ...	2.25 amps. max.
Anode Supply Voltage	... ...	... ...	... ...	... ...	—see Rating Chart I
D.C. Output Current	... ...	... ...	... ...	... ...	—see Rating Chart I

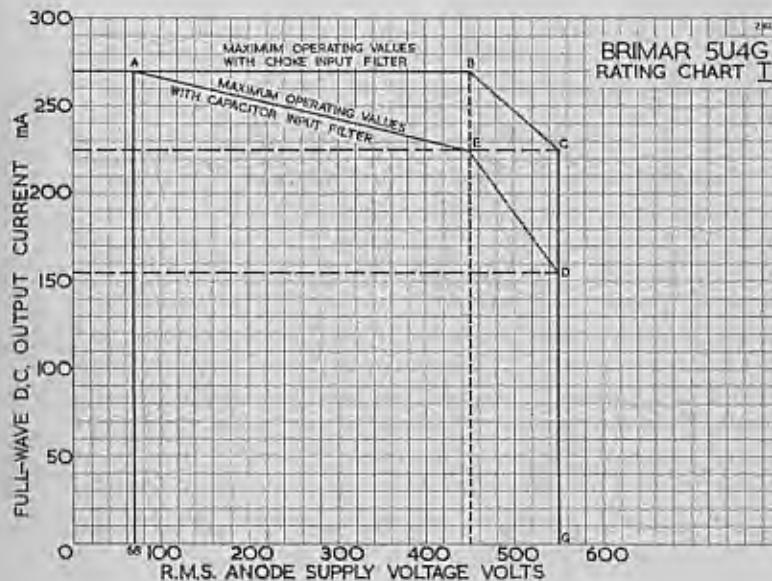
CHARACTERISTICS AS A FULL-WAVE RECTIFIER

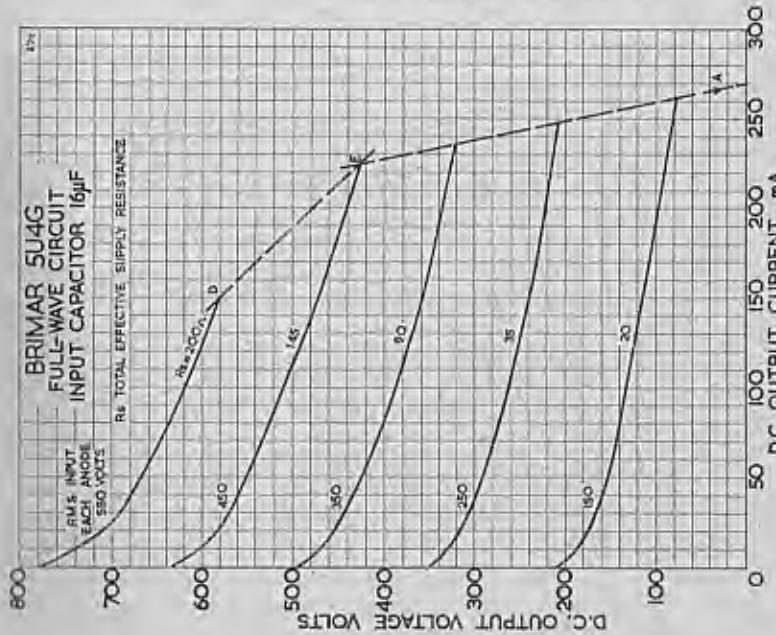
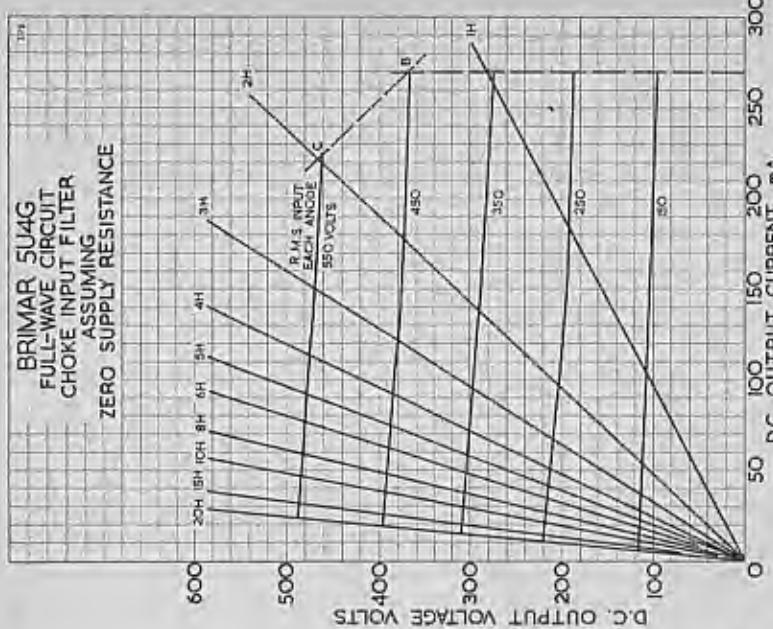
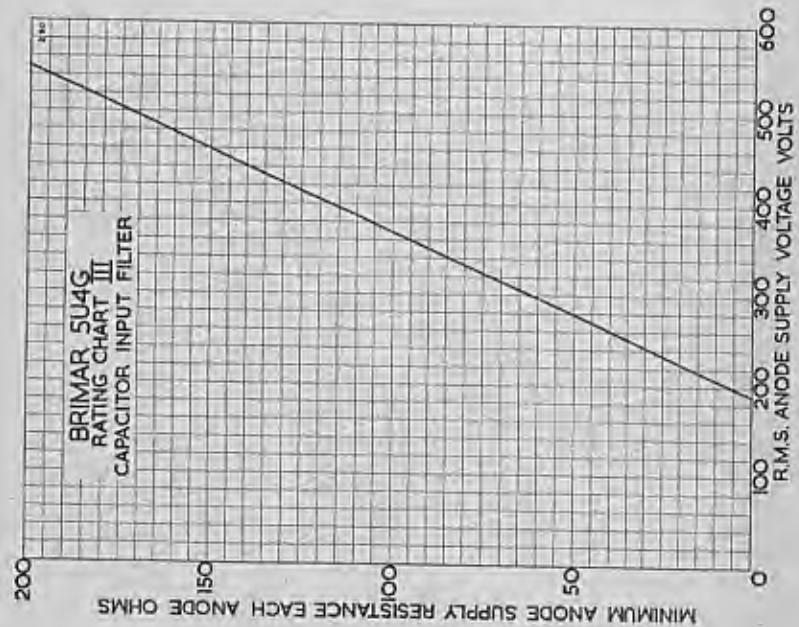
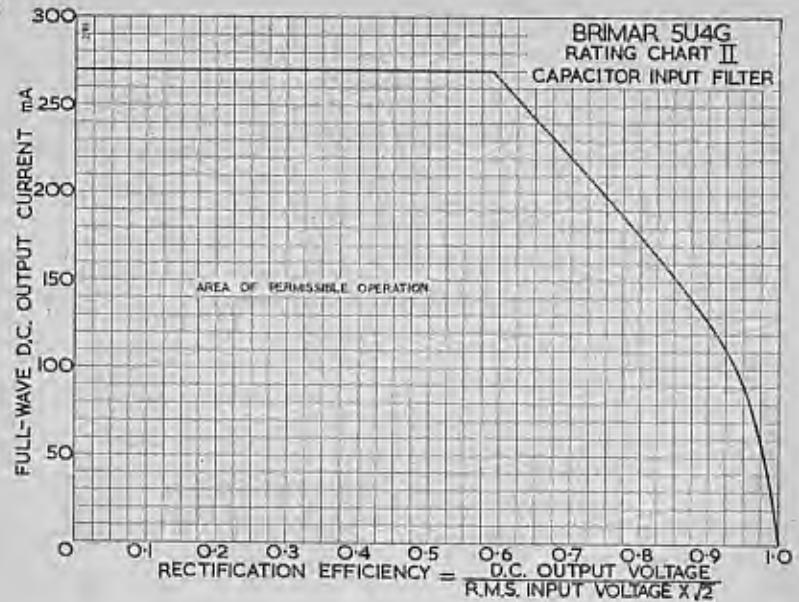
CAPACITOR INPUT

R.M.S. Input per Anode	... ...	450 volts	R.M.S. Input per Anode	... ...	550 volts
Rectified Current	... ...	225 mA	Rectified Current	... ...	225 mA
D.C. Output Voltage	... ...	430 volts	D.C. Output Voltage	... ...	460 volts
Supply Impedance per Anode	145 Ω		Minimum Filter Input		
Reservoir Capacitor	16 μ F		Choke	... ...	2 Henries

† Limiting value at 220 mA. For operating currents less than 220 mA refer to curve.

For notes on use of rating charts, refer to "Valve Ratings" section.







Current Equipment Type

TYPE 5V4G

(OCTAL BASE)

FULL-WAVE RECTIFIER

Filament Voltage 5.0 volts Filament Current 2.0 amperes

RATINGS

Peak Inverse Voltage	.....	1,400 volts max.
Peak Current (each Anode)	.....	525 mA max.
Peak Surge Current	.....	1.75 amps. max.
Anode Supply Voltage	.....	—see Rating Chart
D.C. Output Current	.....	—see Rating Chart

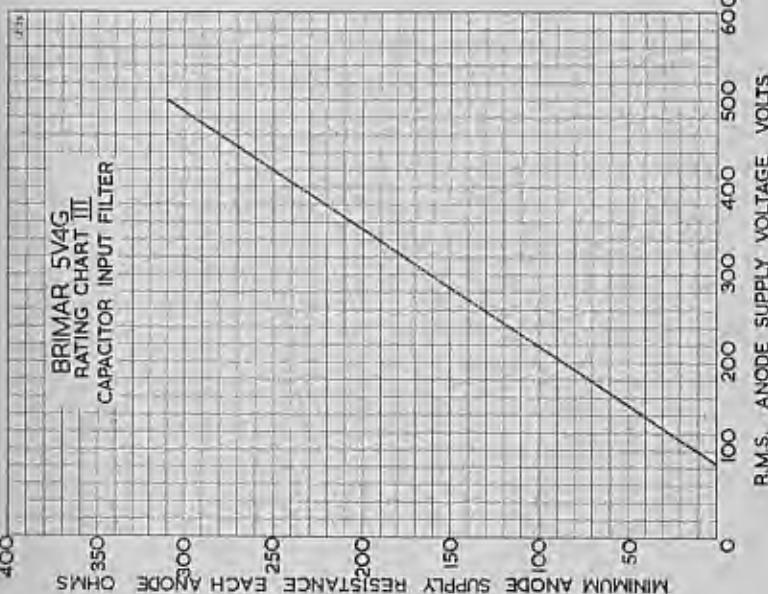
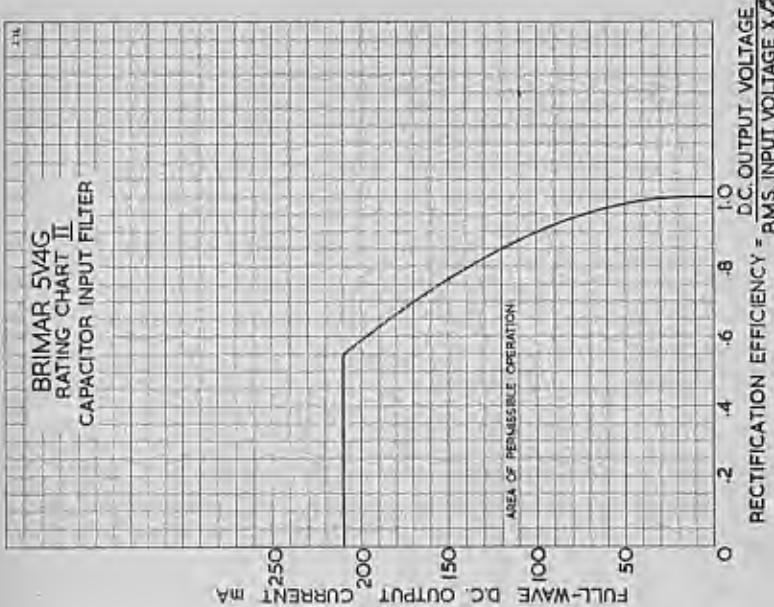
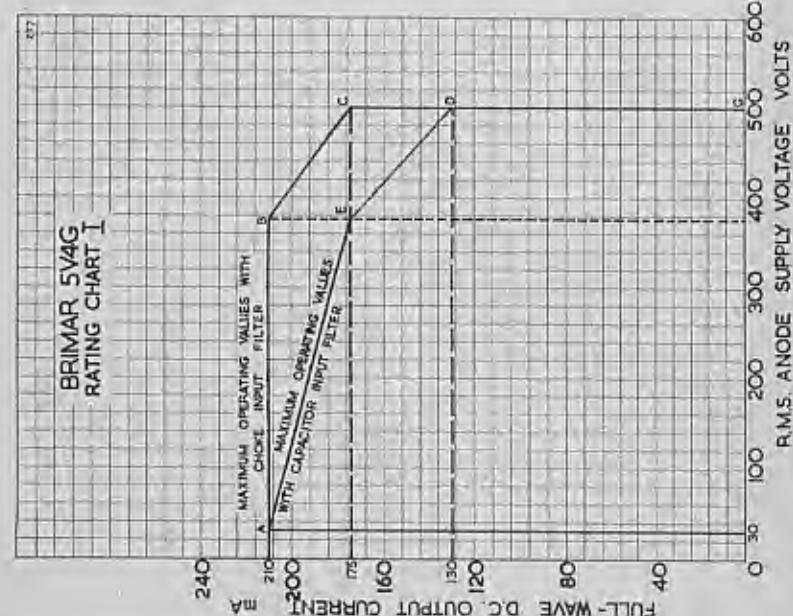
CHARACTERISTICS AS A FULL-WAVE RECTIFIER

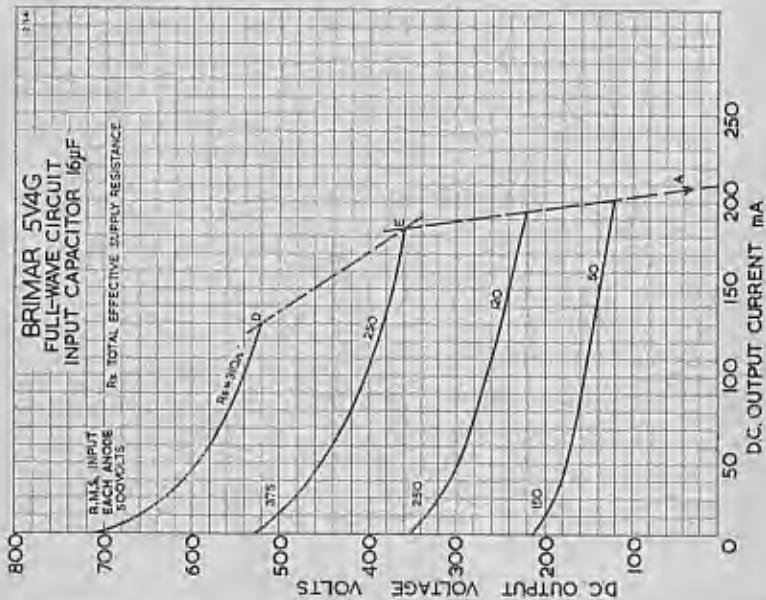
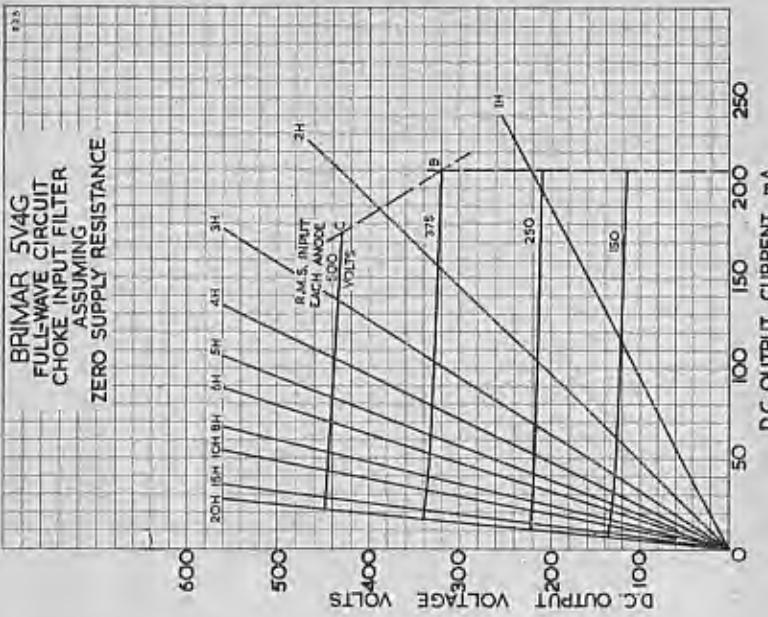
CAPACITOR INPUT

R.M.S. Input per Anode	375 volts	R.M.S. Input per Anode	500 volts
Rectified Current	175 mA	Rectified Current	175 mA
D.C. Output Voltage	360 volts	D.C. Output Voltage	430 volts
Supply Impedance per Anode	250 ohms	Minimum Filter Input	3 Henries
Reservoir Capacitor	16 μ F	Choke	.....

† Limiting value at 140 mA. For operating currents less than 140 mA, refer to curve.

For notes on use of rating charts, refer to "Valve Ratings" section.



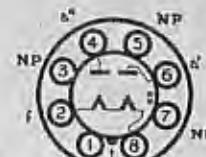


Maintenance Type

TYPE 5Y3GT

(OCTAL BASE)

FULL-WAVE RECTIFIER



The BRIMAR type 5Y3GT is a directly heated full-wave rectifier for A.C. mains equipment of moderate power requirements.

RATINGS

Filament Voltage	...	...	...	...	...	...	5.0 volts
Filament Current	...	...	...	...	...	...	2.0 amp.
Peak Inverse Voltage	...	...	...	...	...	...	1,400 volts max.
Peak Current (each Anode)	...	...	...	...	...	...	400 mA max.

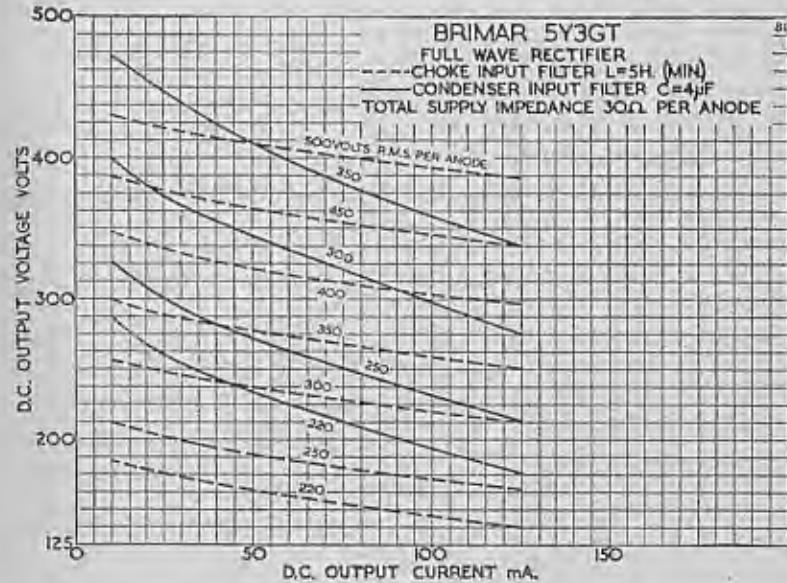
OPERATION AS FULL-WAVE RECTIFIER

CONDENSER INPUT

R.M.S. Input per Anode	...	...	...	...	...	...	350 volts max.
Supply Impedance per Anode	...	...	...	...	...	...	30 ohms. min.
Rectified Current	...	...	...	...	...	...	125 mA max.
Reservoir Condenser	...	...	...	...	...	...	32 μ F max.

CHOKE INPUT

R.M.S. Input per Anode	...	...	...	...	...	...	500 volts max.
Input Choke Inductance	...	...	...	...	...	...	10 Henries min.
Rectified Current	...	...	...	...	...	...	125 mA max.





Current Equipment Type

TYPE 5Z4G
(OCTAL BASE)
FULL-WAVE RECTIFIER



Filament Voltage 5.0 volts Filament Current 2.0 amps.

RATINGS

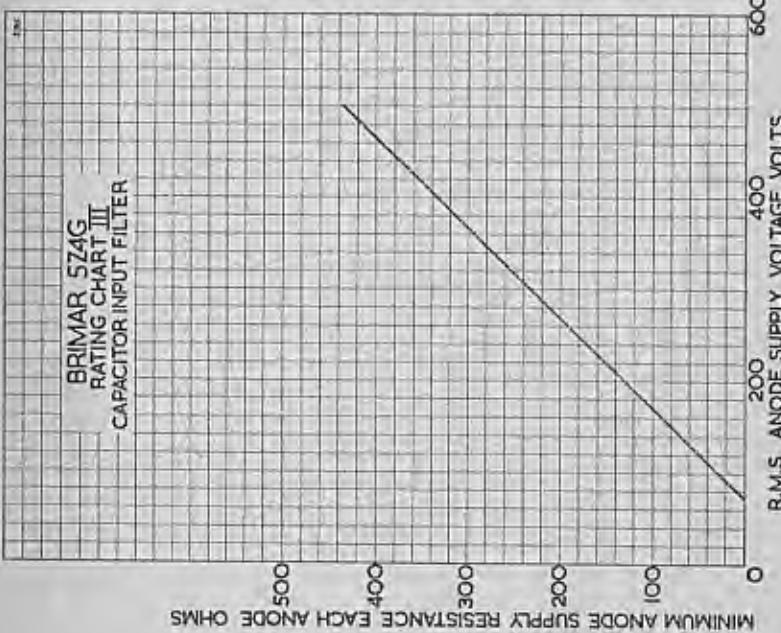
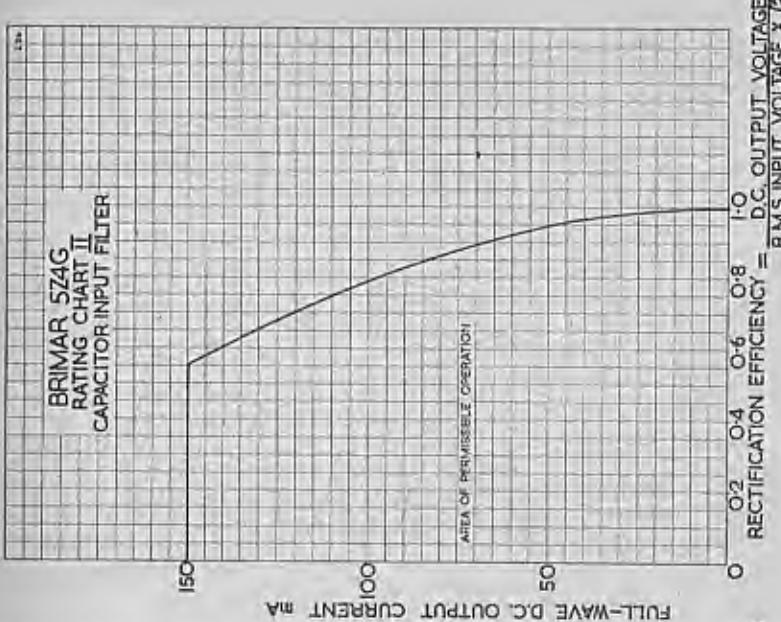
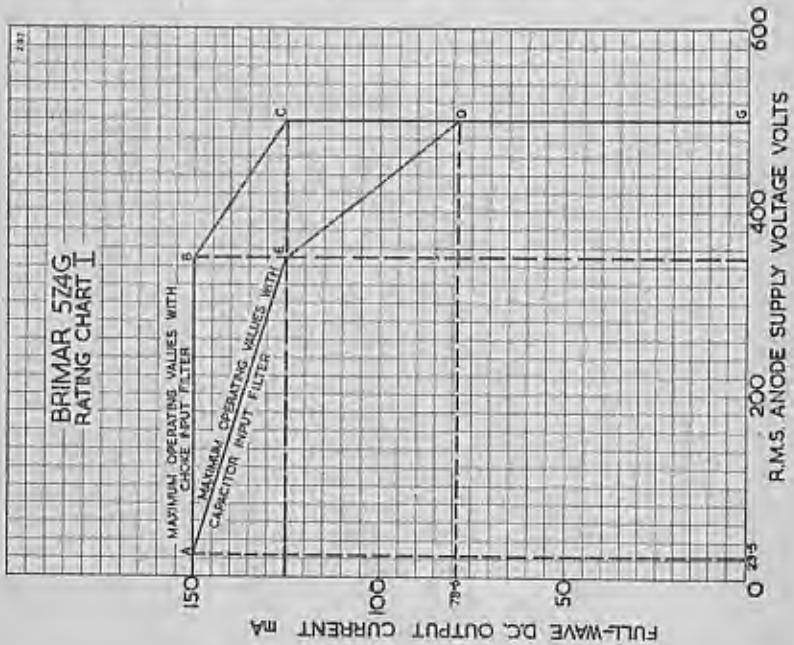
Peak Inverse Voltage	... ...	1,100 volts max.
Peak Current (each Anode)	... ...	375 mA max.
Peak Surge Current	... ...	1.25 amps. max.
Anode Supply Voltage	... ...	—see Rating Chart I
D.C. Output Current	... ...	—see Rating Chart I

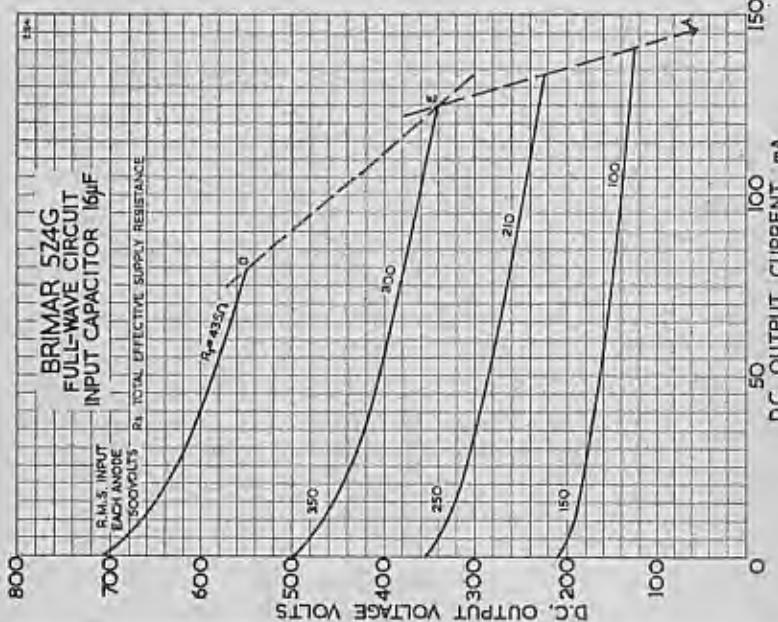
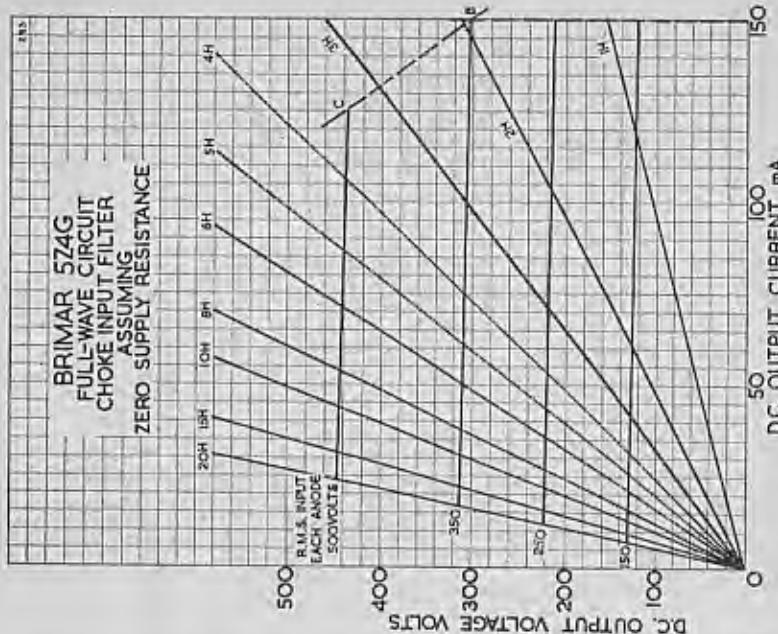
CHARACTERISTICS AS A FULL-WAVE RECTIFIER

CAPACITOR INPUT	CHOKE INPUT
R.M.S. Input per Anode	350 volts
Rectified Current	125 mA
D.C. Output Voltage	340 volts
Supply Impedance per Anode	300 Ω
Reservoir Capacitor	16 μF
	Choke
	Minimum Filter Input
	4 Henries

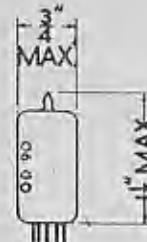
† Limiting value at 105 mA. For operating currents less than 105 mA, refer to curve.

For notes on use of rating charts, refer to "Valve Ratings" section.

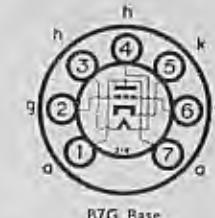




Current Equipment Type



TYPE 6AF4A
MINIATURE
U.H.F.
OSCILLATOR
TRIODE



The BRIMAR 6AF4A is intended for use as a U.H.F. oscillator valve up to 1000 Mc/s

RATINGS

Heater Voltage	...	...	...	...	...	...	...	6.3 volts
Heater Current	...	...	...	...	...	...	...	0.225 amp.
Anode Voltage	...	...	...	...	...	...	...	150 volts max.
Anode Dissipation	...	...	...	...	...	...	...	2.25 watts max.
D.C. Grid Voltage	...	...	...	...	...	...	...	-50 volts max.
D.C. Grid Current	...	...	...	...	...	...	...	8 mA max.
Grid Circuit Resistance using Cathode Bias	...	...	...	...	...	...	...	500 K Ω max.
D.C. Cathode Current	...	...	...	...	...	...	...	28 mA max.
Peak Heater-Cathode Voltage—Heater negative	...	...	...	...	...	...	...	50 volts max.
Heater positive	...	...	...	...	...	...	...	50 volts max. *

* D.C. component 25 volts max.

OPERATING CHARACTERISTICS

Anode Voltage	...	...	...	...	...	...	80	100 volts
Cathode Bias Resistor	...	...	...	...	...	...	150	150 Ω
Anode Current	...	...	...	...	...	...	16	20 mA
Mutual Conductance	...	...	...	...	...	...	6.6	7.5 mA/V
Anode Impedance	...	...	...	...	...	...	2.27	2.13 K Ω
Amplification Factor	...	...	...	...	...	...	15	16

TYPICAL CONDITIONS AS AN OSCILLATOR AT 950 Mc/s.

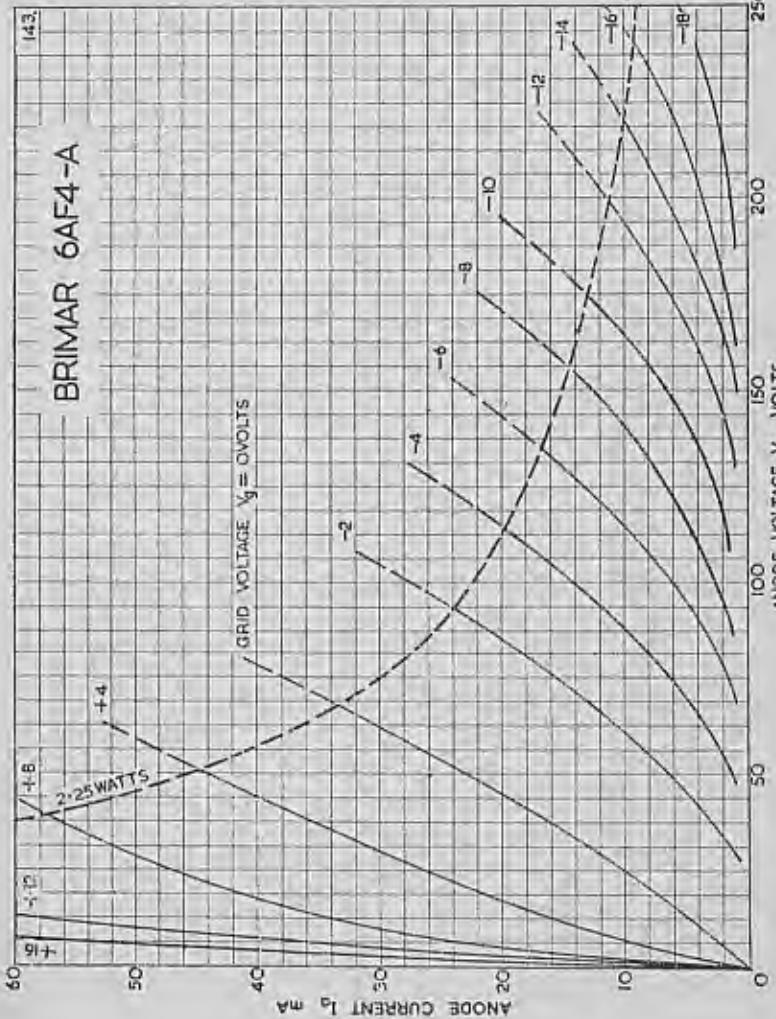
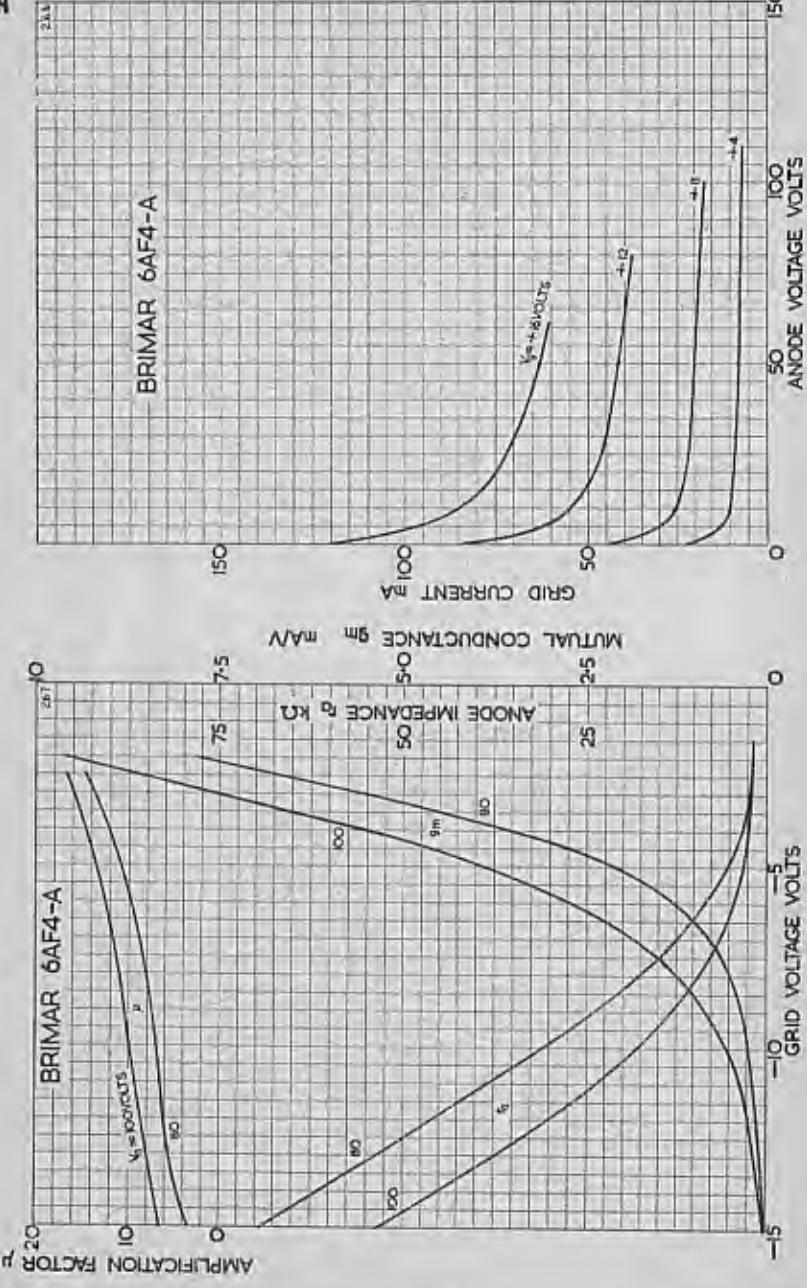
Anode Voltage	...	...	...	...	...	...	100	volts
Grid Resistance	...	...	...	...	...	...	10 K Ω	
Anode Current	...	...	...	...	...	...	22	mA
Grid Current	...	...	...	...	...	...	400	μ A
Power Output	...	...	...	...	...	...	160	mW

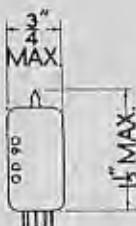
INTER-ELECTRODE CAPACITANCES *

Input	...	...	...	...	...	...	2.2	pF
Output	...	...	...	...	...	...	0.45	pF
Grid to Anode	...	...	...	...	...	...	1.9	pF

* With no external shield.

Type 6AF4A is a commercial equivalent to the CV5074.





Maintenance Type

TYPE 6AK5

MINIATURE

HIGH SLOPE

R.F. PENTODE



The BRIMAR type 6AK5 is a miniature R.F. Pentode intended for use as an R.F. or I.F. Amplifier particularly in wide-band applications. It is useful as an amplifier up to 400 Mc/s.

RATINGS

Heater Voltage	...	...	...	...	...	...	...	6.3 volts
Heater Current	...	...	...	...	...	...	...	0.175 amp.
Anode Voltage	...	...	...	...	...	...	...	180 volts max.
Anode Dissipation	...	...	...	...	...	...	...	1.7 watts max.
Screen (g_2) Voltage	...	...	...	...	...	...	...	90 volts max.
Screen Voltage ($V_{g_2} = 0$)	...	...	...	...	...	...	...	180 volts max.
Screen Dissipation	...	...	...	...	...	...	...	0.5 watts max.
Peak Heater-Cathode Voltage	...	...	...	...	...	...	...	120 volts max.

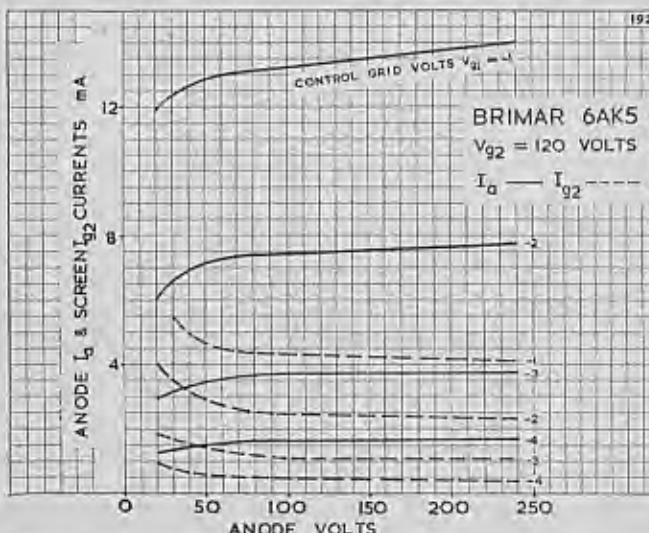
OPERATING CHARACTERISTICS

Anode Voltage	...	...	...	...	120	180	volts
Anode Current	...	...	...	...	7.5	7.7	mA
Screen Voltage	...	...	...	...	120	120	volts
Screen Current	...	...	...	...	2.5	2.4	mA
Cathode Bias Resistor	...	...	...	...	180	180	ohms
Mutual Conductance	...	...	...	...	5.0	5.1	mA/V
Anode Impedance (approx.)	...	...	...	...	0.3	0.5	Megohm
Control Grid (g_1) Voltage for anode current of 10 μ A (approx.)	...	...	...	...	-8.5	-8.5	volts

INTER-ELECTRODE CAPACITANCES*

Input	...	...	...	...	...	...	4.0 pF
Output	...	...	...	...	...	...	2.1 pF
Control Grid to Anode	...	...	...	...	...	...	0.03 pF max.

* Measured without external shield.

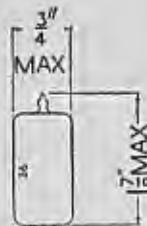


Maintenance Type

TYPE 6AK6

MINIATURE

POWER PENTODE



B7G Base



The BRIMAR type 6AK6 is a miniature output pentode with low heater consumption suitable for use in both AC and AC/DC equipment. It is particularly suitable where power economy and small physical size are of prime importance.

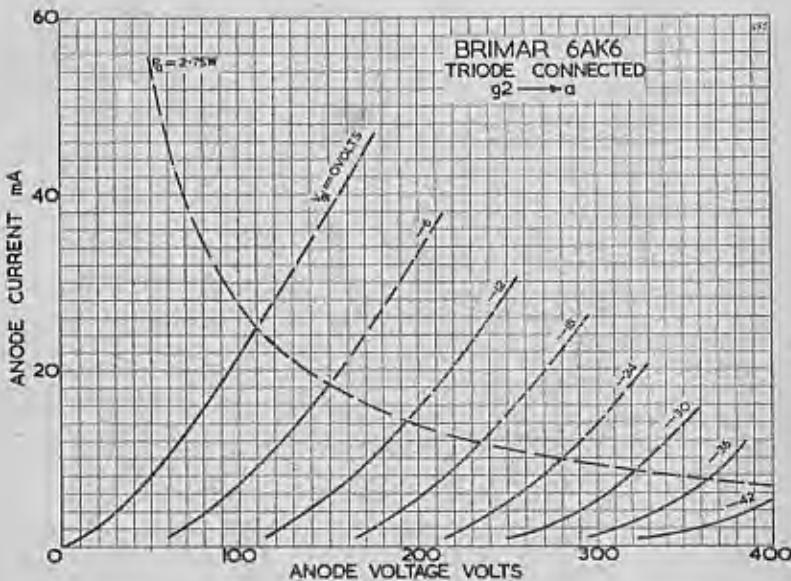
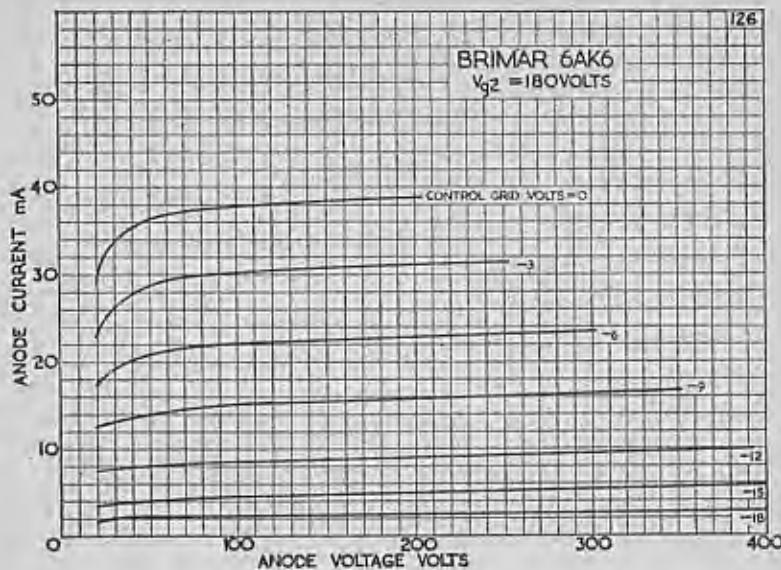
RATINGS

Heater Voltage	...	...	...	...	...	...	...	6.3 volts
Heater Current	...	...	...	...	...	...	...	0.15 amp.
Anode Voltage	...	...	...	...	...	...	...	275 volts max.
Anode Dissipation	...	...	...	...	...	...	...	2.75 watts max.
Screen (g_2) Voltage	...	...	...	...	...	...	...	250 volts max.
Screen Dissipation	...	...	...	...	...	...	...	0.75 watts max.
D.C. Cathode Current	...	...	...	...	...	...	...	21 mA max.

OPERATING CHARACTERISTICS (CLASS A)

Anode Voltage	...	...	...	...	...	...	...	180 volts
Anode Current	...	...	...	...	...	...	...	15 mA
Screen Voltage	...	...	...	...	...	...	...	180 volts
Screen Current	...	...	...	...	...	...	...	2.5 mA
Control Grid (g_1) Voltage	...	...	...	...	...	...	...	-9 volts
Cathode Bias Resistor	...	...	...	...	...	...	...	520 ohms
Anode Impedance	...	...	...	...	...	...	...	200,000 ohms
Mutual Conductance	...	...	...	...	...	...	...	2.3 mA/V
Inner Amplification Factor (μ_{g1-g2})	...	...	...	...	...	...	...	10.5
Optimum Load	...	...	...	...	...	...	...	10,000 ohms
Power Output	...	...	...	...	...	...	...	1.1 watts
Harmonic Distortion	...	...	...	...	...	...	...	10 per cent.

VALVES



Current Equipment Type

TYPE 6ALS

MINIATURE DOUBLE
DIODE

B7G Base

RATINGS

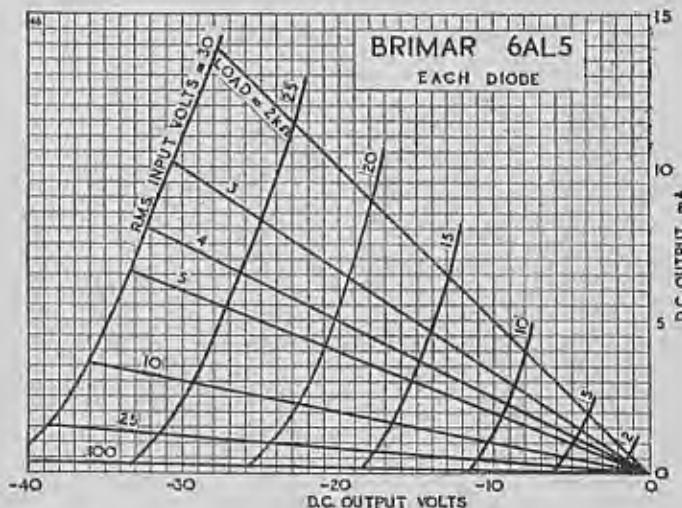
Heater Voltage	...	...	...	...	...	...	6.3 volts
Heater Current	...	...	...	...	...	...	0.3 amp.
Peak Inverse Voltage	...	...	...	...	...	...	420 volts max.
Peak Anode Current (each Anode)	...	...	...	...	...	...	54 mA max.
Resonant Frequency (each Section)	...	...	...	...	...	...	700 Mc/s approx.

OPERATION AS HALF-WAVE RECTIFIER

R.M.S. Input per Anode	...	...	...	...	...	150 volts max.
Supply Impedance per Anode	...	...	...	...	...	300 ohms min.
Rectified Current per Anode	...	...	...	...	...	9 mA max.

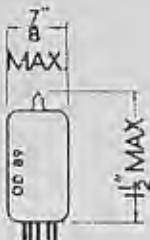
INTER-ELECTRODE CAPACITANCES

Diode 1 to Cathode 1 and Heater	...	...	...	...	...	3.2 pF
Diode 2 to Cathode 2 and Heater	...	...	...	...	...	3.2 pF
Cathode 1 to Diode 1 and Heater	...	...	...	...	...	3.6 pF
Cathode 2 to Diode 2 and Heater	...	...	...	...	...	3.6 pF
Diode 1 to Diode 2	...	...	...	...	...	0.026 pF max.



Type 6ALS is a commercial equivalent to the CV140.

Current Equipment Type



TYPE 6AM4
MINIATURE
GROUNDED GRID
AMPLIFIER TRIODE



The BRIMAR 6AM4 is a miniature B9A based triode suitable for grounded grid amplifier or mixer use in the frequency range 470 to 890 Mc/s.

RATINGS

Heater Voltage	...	...	...	...	...	...	6.3 volts
Heater Current	...	...	...	...	...	...	0.225 amp.
Anode Voltage	...	...	...	...	...	...	200 volts max.
Anode Dissipation	...	...	...	...	...	...	2.0 watts
Positive D.C. Grid Voltage	...	...	...	...	...	...	0 volts max.
Heater-Cathode Potential—Heater Positive	...	...	...	...	...	...	80 volts max.
Heater Negative	...	...	...	...	...	...	80 volts max.*

* 250 volts max. under cut-off conditions in cascade type circuits with direct coupled drive.

OPERATING CHARACTERISTICS

Anode Voltage	...	...	...	...	...	...	200 volts
Cathode Bias Resistor	...	...	...	...	...	...	100 ohms
Anode Current	...	...	...	...	...	...	10 mA
Mutual Conductance	...	...	...	...	...	...	9.8 mA/V
Anode Impedance	...	...	...	...	...	...	8,700 ohms
Amplification Factor	...	...	...	...	...	...	85
Grid Voltage for $I_a = 10\mu A$	...	...	...	...	...	...	-6.5 volts

NOTE: Fixed bias operation is not recommended.

CHARACTERISTICS AS A MIXER†

Anode Voltage	...	...	...	...	...	...	125 volts
Cathode Bias Resistor	...	...	...	...	...	...	220 ohms
Peak Heterodyne Voltage	...	...	...	...	...	...	1.6 volts
Anode Current	...	...	...	...	...	...	3.7 mA
Conversion Conductance	...	...	...	...	...	...	2.55 mA/V

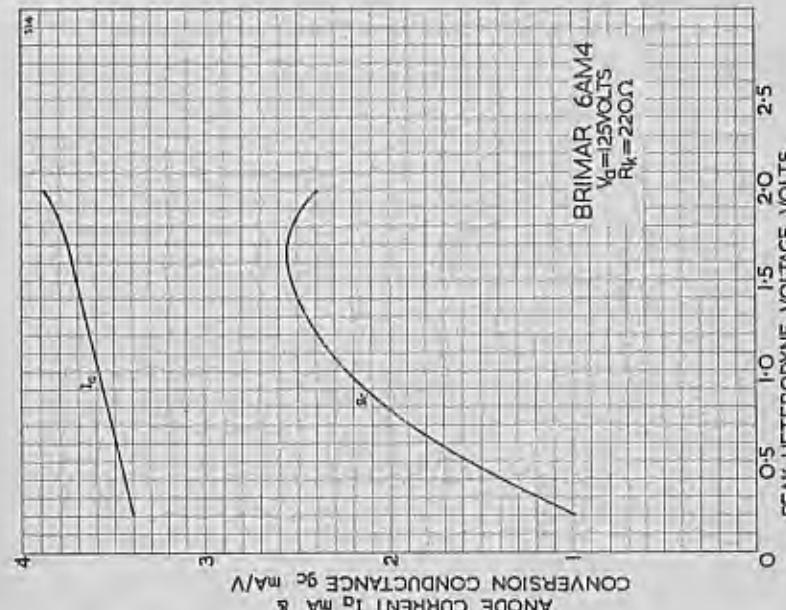
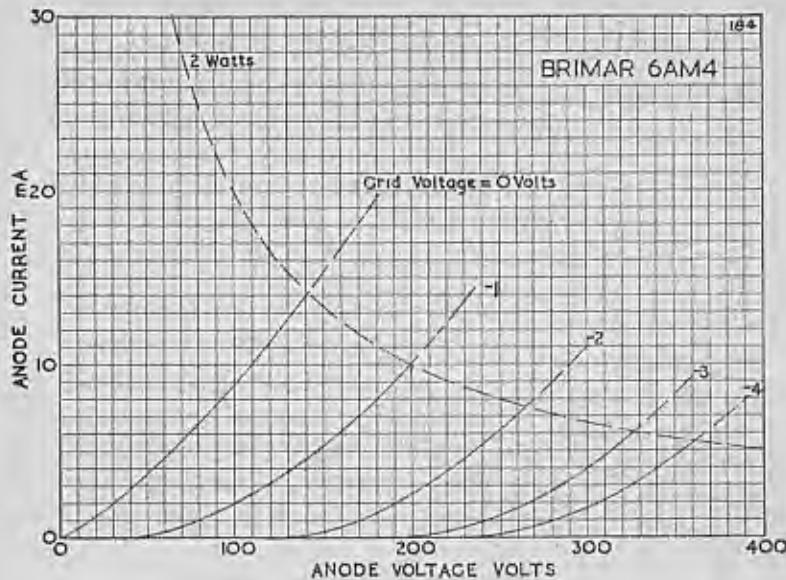
† Based on low-frequency measurements. Optimum conditions at operating frequencies may be somewhat different.

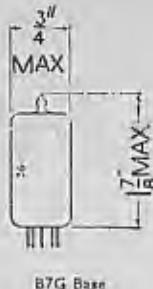
INTER-ELECTRODE CAPACITANCES

	With external screen	Without external screen
Anode to Cathode	...	0.16 pF
Cathode to Grid plus Heater	...	4.6 pF
Anode to Grid plus Heater	...	2.8 pF
Heater to Cathode	...	1.8 pF

* Connected to Grid.

Type 6AM4 is a commercial equivalent to the CV5073.





Maintenance Type

TYPE 6AMS
POWER PENTODE



B7G Base

RATINGS

Heater Voltage	...	...	...	...	...	6.3 volts
Heater Current	...	...	...	...	...	0.2 amp.
Anode Voltage	...	...	...	...	...	250 volts max.
Anode Dissipation	...	...	...	...	...	4.0 watts max.
Screen (g_2) Voltage	...	...	...	...	...	250 volts max.
Screen Dissipation	...	...	...	...	...	0.60 watt max.
Heater to Cathode Potential	...	...	...	...	...	150 volts max.

OPERATING CHARACTERISTICS

	Single Valve	2 Valves		volts
		Class A	Class AB1	
Anode Voltage	...	250	250	volts
Anode Current	...	16	22	mA
Screen Voltage	...	250	250	volts
Screen Current	...	2.4	3.2	mA
Control Grid (g_1) Voltage	...	-13.5	-15	volts
Cathode Bias Resistor	...	680	600	ohms
Anode Impedance	...	0.15	—	meg.
Mutual Conductance	...	2.6	—	mA/V
Inner Amplification Factor (μ_{g1}, g_2)	...	12	—	
Optimum Load	...	16,000	24,000	ohms
Power Output	...	1.4	4.0	watts
Harmonic Distortion	...	10	3.2	per cent.

INTER-ELECTRODE CAPACITANCES

Input	...	...	...	...	...	4.2 pF
Output	...	...	...	...	...	3.2 pF
Grid to Anode	...	...	...	...	...	0.5 pF max.

Current Equipment Type

TYPE 6AM6
MINIATURE
HIGH SLOPE
R.F. PENTODE



The BRIMAR 6AM6 is an indirectly heated high slope R.F. pentode suitable for a wide variety of applications. It may be used as an R.F., I.F. or video amplifier, as a limiter, or as a frequency changer at frequencies up to 100 Mc/s in conjunction with a suitable oscillator.

RATINGS

Heater Voltage	...	...	...	...	...	...	6.3 volts
Heater Current	...	...	...	...	...	...	0.3 amp.
Anode Voltage	...	...	...	...	...	...	275 volts max.
Anode Dissipation	...	...	...	...	...	...	2.5 watts max.
Screen (g_2) Voltage	...	...	...	...	...	...	275 volts max.
Screen Dissipation	...	...	...	...	...	...	0.8 watts max.
Heater to Cathode Potential	...	...	...	...	...	...	150 volts max.

OPERATING CHARACTERISTICS[Suppressor Grid (g_3) connected to Cathode]

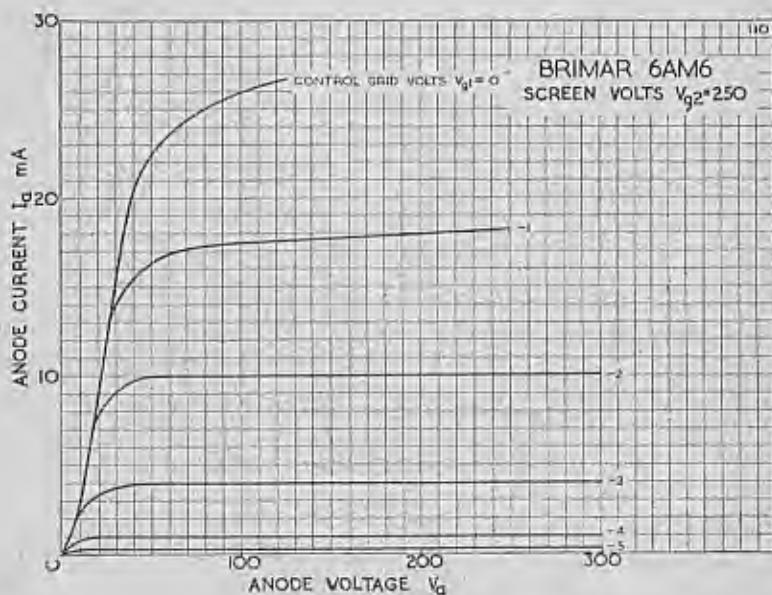
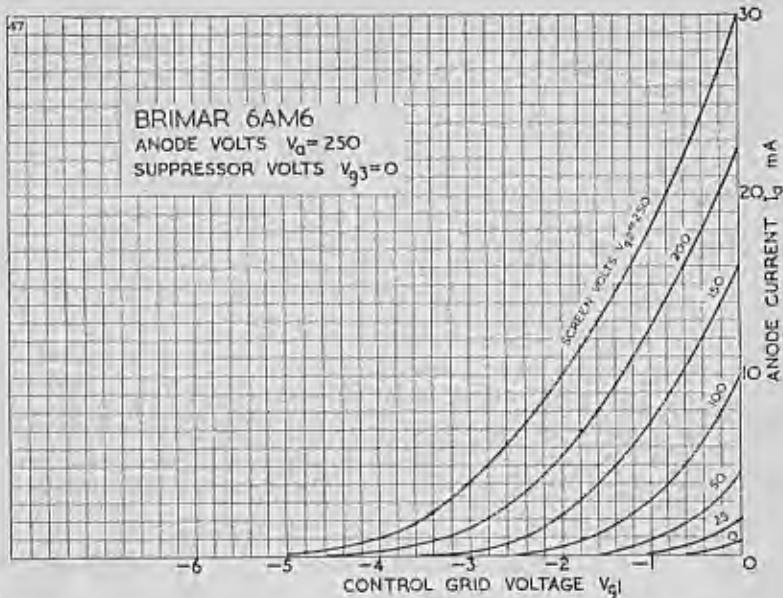
Anode Voltage	...	...	...	...	200	250	volts
Anode Current	...	...	...	...	9.0	10.0	mA
Screen Voltage	...	...	...	...	200	250	volts
Screen Current	...	...	...	...	2.25	2.6	mA
Control Grid (g_1) Voltage	...	...	...	...	-1.5	-2.0	volts
Cathode Bias Resistor	...	...	...	...	135	160	ohms
Anode Impedance (approx.)	...	...	...	...	0.8	1.0	meg.
Mutual Conductance	...	...	...	...	7.5	7.5	mA/V
Input Resistance at 45 Mc/s.	...	...	...	...	7,000	8,200	ohms
Control Grid Voltage	...	...	...	...	-4.5	-5.5	volts
(For Cathode Current cut-off)							
Working Input Capacity	...	...	...	...	10.4	10.1	pF
Change in Input Capacity	...	...	...	...	2.3	2.0	pF
(g_1 biased to cut-off)							
Inner Amplification Factor (μ_{g1}, g_2)	...	...	...	...	70	70	

INTER-ELECTRODE CAPACITANCES*

Input	...	...	...	...	...	...	7.5 pF
Output	...	...	...	...	...	...	3.2 pF
Control Grid to Anode	...	...	...	...	...	...	0.01 pF

* With close fitting shield connected to Cathode.

Type 6AM6 is a commercial equivalent of the CV138.



Current Equipment Type



TYPE 6AQ5
MINIATURE
OUTPUT BEAM
TETRODE



RATINGS

Heater Voltage	...	...	...	...	...	...	...	6.3 volts
Heater Current	...	...	...	...	...	...	...	0.45 amp.
Anode Voltage	...	...	...	...	...	...	...	250 volts max.
Anode Dissipation	...	...	...	...	...	...	...	12 watts max.
Screen (g_2) Voltage	...	...	...	...	...	...	...	250 volts max.
Screen Dissipation	...	...	...	...	...	...	...	2.0 watts max.
Heater-Cathode Potential	...	...	...	...	...	...	...	250 volts max.
D.C. Cathode Current	...	...	...	...	...	...	...	65 mA max.

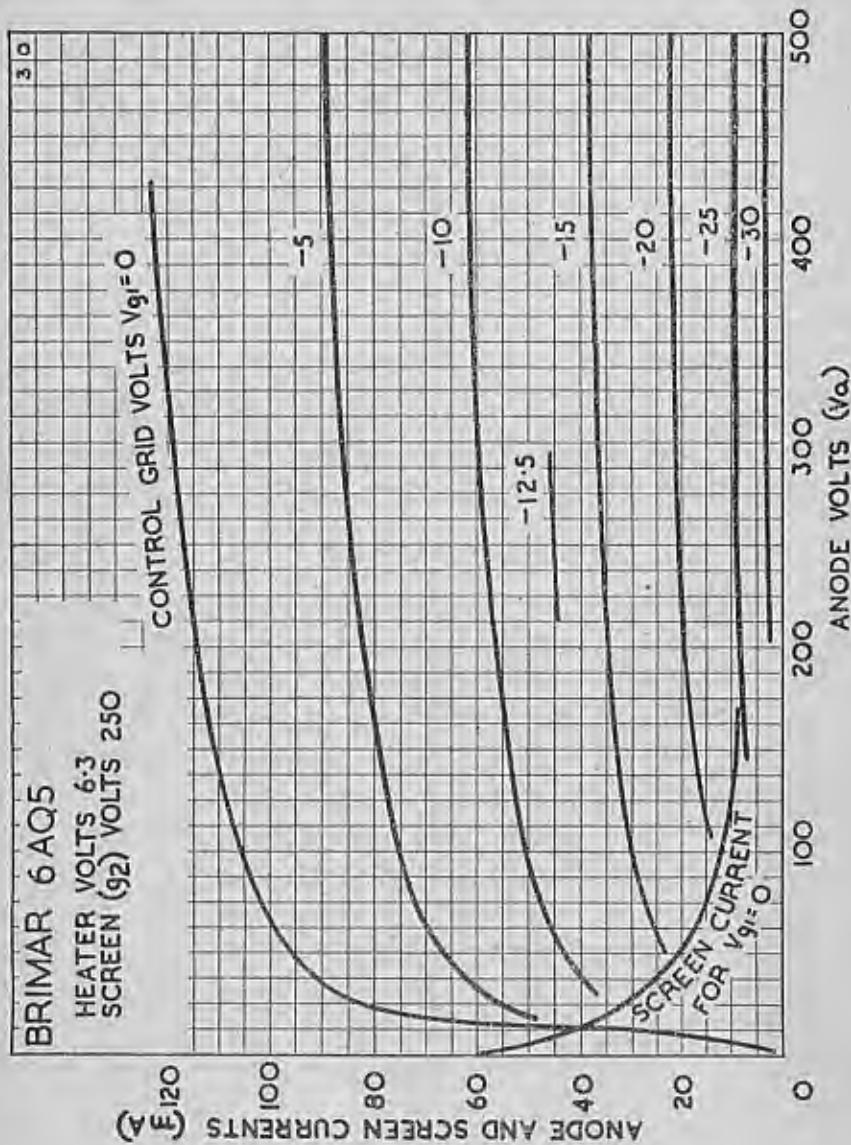
OPERATING CHARACTERISTICS

Anode Voltage	...	...	...	...	180	250	volts
Anode Current	...	...	...	...	29	45	mA
Screen Voltage	...	...	...	...	180	250	volts
Screen Current	...	...	...	...	3.0	4.5	mA
Control Grid (g_1) Voltage	...	...	...	...	-8.5	-12.5	volts
Cathode Bias Resistor	...	...	...	...	270	240	ohms
Anode Impedance	...	...	...	...	58,000	52,000	ohms
Mutual Conductance	...	...	...	...	3.7	4.1	mA/V
Inner Amp. Factor (μ_{IG, g_2})	...	...	...	...	10	10	
Optimum Load	...	...	...	...	5,500	5,000	ohms
Power Output	...	...	...	...	2.0	4.5	watts
Harmonic Distortion	...	...	...	...	8.0	8.0	per cent.

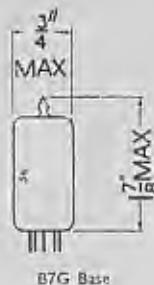
INTER-ELECTRODE CAPACITANCES *

Input	...	...	...	...	...	...	...	7.6 pF
Output	...	...	...	...	...	...	...	6.0 pF
Control Grid to Anode	...	...	...	...	...	...	...	0.35 pF

* With no external shield.



Current Equipment Type



TYPE 6AT6
MINIATURE
DOUBLE DIODE
TRIODE



RATINGS

Heater Voltage	...	...	...	...	...	...	6.3 volts
Heater Current	...	...	...	...	...	...	0.3 amp.
Anode Voltage	...	...	...	...	...	...	300 volts max.
Diode Current	...	...	...	...	...	...	1.0 mA max.

OPERATING CHARACTERISTICS

Anode Voltage	...	...	...	...	...	...	250 volts
Anode Current	...	...	...	...	...	...	1.0 mA
Grid Voltage	...	...	...	...	...	...	-3 volts
Anode Impedance	...	...	...	...	...	...	58,000 ohms
Mutual Conductance	...	...	...	...	...	...	1.2 mA/V
Amplification Factor	...	...	...	...	...	...	70

OPERATION AS RESISTANCE COUPLED AMPLIFIER

	100	250	250 volts
Anode Supply Voltage
Anode Load Resistor	...	0.5	0.25 meg.
Grid Resistor	...	1.0	1.0 meg.
Cathode Bias Resistor	...	9,000	3,000 0 ohms
Peak Output	...	16	43 40 volts
*Stage Gain	...	33	42 42
*Harmonic Distortion	...	2	1 5 per cent.

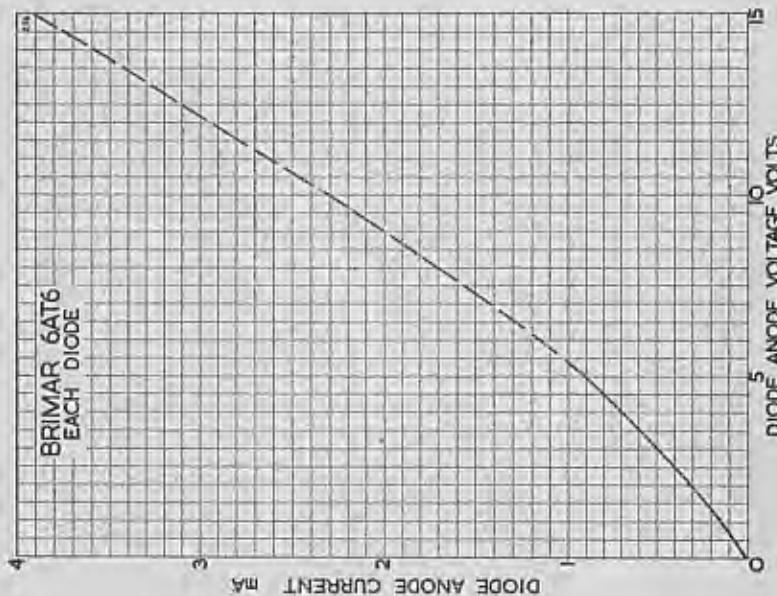
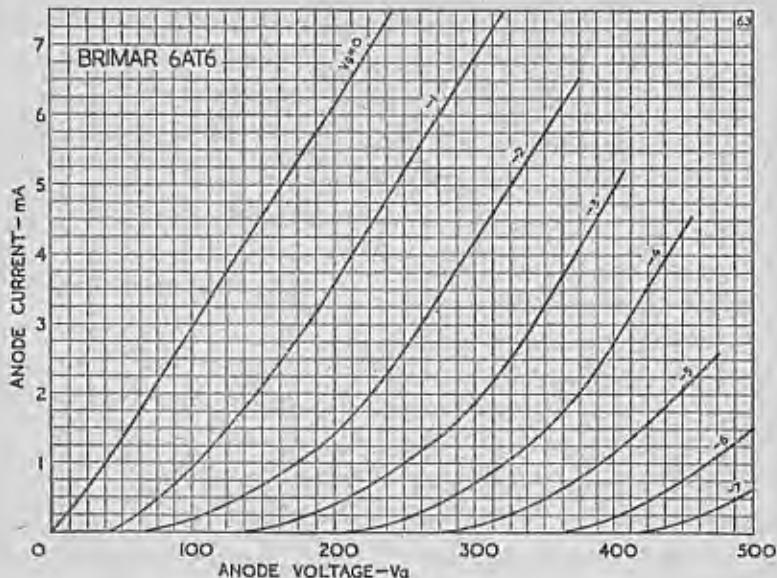
* Figures are for 12 volts peak output.

INTER-ELECTRODE CAPACITANCES *

Grid to Cathode	...	...	...	...	...	2.3 pF
Anode to Cathode	...	...	...	...	...	1.1 pF
Grid to Anode	...	...	...	...	...	2.1 pF
Diode Anode (a") to Grid	...	...	...	...	...	0.025 pF max.

* With no external shield.

Type 6AT6 is a commercial equivalent of the CV452.



Current Equipment Type

TYPE 6AU6

HIGH SLOPE

R.F. PENTODE



B7G Base

Type 6AU6 is a sharp cut-off pentode suitable for use as R.F. or A.F. amplifier, limiter or sync. separator.

RATINGS

Heater Voltage	...	...	...	...	...	6.3	volts
Heater Current	...	...	...	...	...	0.3	amp.
Anode Voltage	...	...	...	...	...	300	volts max.
Anode Dissipation	...	...	...	...	...	3.0	watts max.
Screen (g_2) Supply Voltage	...	...	...	...	...	300	volts
Screen (g_2) Voltage	...	...	...	...	...	150	volts max.
Screen Dissipation	...	...	...	...	...	0.65	watts max.

OPERATING CHARACTERISTICS

[Suppressor Grid (g_3) connected to Cathode]

Anode Voltage	...	...	...	...	250	250	100	volts
Anode Current	...	...	...	...	10.8	7.6	5.2	mA
Screen Voltage	...	...	...	...	150	125	100	volts
Screen Current	...	...	...	...	4.3	3.0	2.0	mA
Control Grid (g_1) Voltage	...	...	...	...	-1	-1	-1	volts
Cathode Bias Resistor	...	...	...	...	68	100	140	ohms
Anode Impedance	...	...	...	...	1.0	1.5	0.5	meg.
Mutual Conductance	...	...	...	...	5.2	4.4	3.9	mA/V
Inner Amplification Factor ((μ_{g_1}, g_2))	...	...	...	...	41	41	41	
Input Impedance (50 Mc/s)	...	...	...	...	3,500	—	—	ohms
Input Impedance (90 Mc/s)	...	...	...	...	900	—	—	ohms
Control Grid Voltage	...	...	...	...	-6.2	-5.2	-4.2	volts

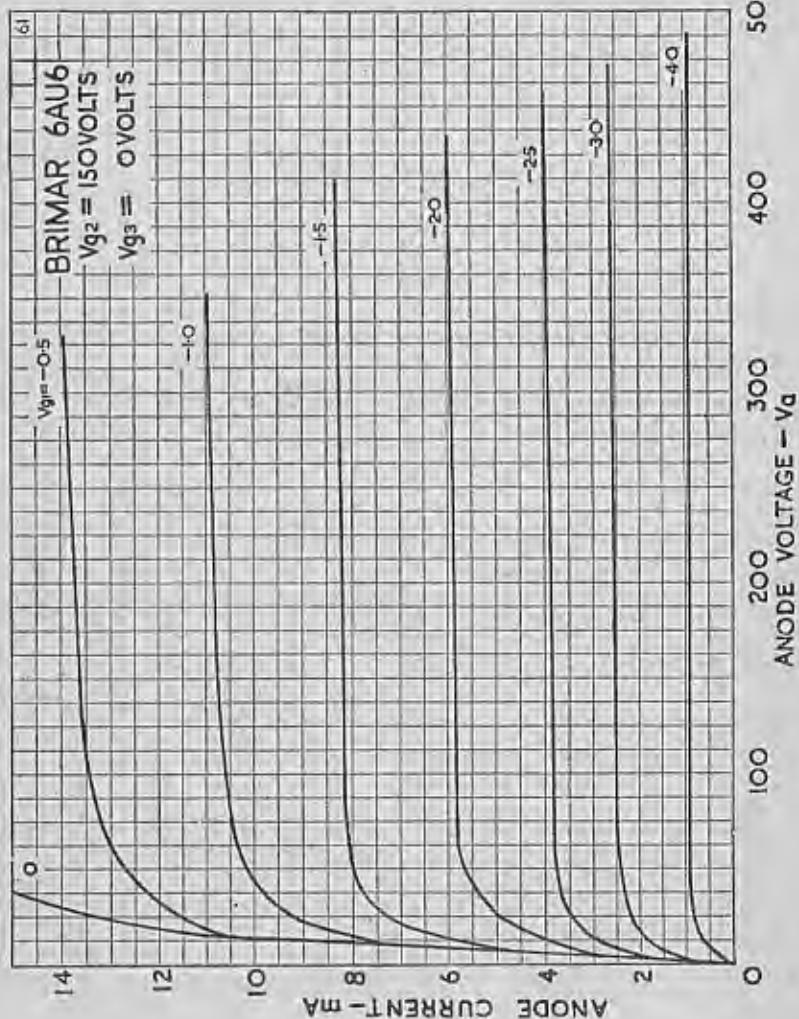
(For Anode Current Cut-off).

INTER-ELECTRODE CAPACITANCES*

Input	...	...	...	...	...	...	5.5	pF
Output	...	...	...	...	...	...	5.0	pF
Grid to Anode	...	...	...	...	...	...	0.0035	pF max.

* With no external shield.

Type 6AU6 is a commercial equivalent to the CV2524.



Maintenance Type

TYPE 6AV6 DOUBLE DIODE TRIODE

The BRIMAR 6AV6 is a miniature double diode triode for use in A.M. receivers for signal detection, A.G.C. and A.F. amplification.

RATINGS

Heater Voltage	...	...	...	...	...	...	6.3 volts.
Heater Current	...	...	...	...	...	...	0.3 amps.
Anode Voltage	...	...	...	...	...	...	300 volts max.
Anode Dissipation	...	...	...	...	...	...	1 watt max.
Diode Anode Current	...	...	...	...	...	...	1 mA max.

OPERATING CHARACTERISTICS (Triode Section)

Anode Voltage	...	...	...	...	100	250	volts
Grid Voltage	...	...	...	...	-1	-2	volts
Anode Current	...	...	...	...	0.5	1.2	mA
Mutual Conductance	...	...	...	...	1.25	1.6	mA/V
Amplification Factor	...	...	...	...	100	100	
Anode Resistance	...	...	...	...	80	62.5	kilohms

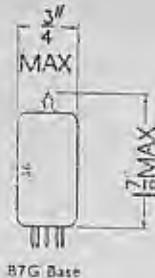
OPERATION AS AN R.C. COUPLED AMPLIFIER

Anode Supply Voltage	...	...	...	...	100	250	volts
Anode Resistor	...	...	...	...	220	220	kilohms
Cathode Resistor	...	...	...	...	7.5	3.3	kilohms
Gain	...	...	...	...	45	62	
Peak Output Voltage	...	...	...	...	10	50	volts

INTER-ELECTRODE CAPACITANCES

Triode Input	...	...	...	...	...	...	2.3 pF
Triode Output	...	...	...	...	...	...	1.1 pF
Triode Grid to Triode Anode	...	...	...	...	...	...	2.1 pF
Diode Anode to Grid	...	...	...	...	...	...	0.025 pF max.





Current Equipment Type

TYPE 6BA6
HIGH SLOPE
VARI-MU
R.F. PENTODE



RATINGS

Heater Voltage	...	...	...	...	...	...	6.3	volts
Heater Current	...	...	...	...	...	...	0.3	amp.
Anode Voltage	...	...	...	...	...	...	300	volts max.
Anode Dissipation	...	...	...	...	...	...	3.0	watts max.
Screen (g2) Supply Voltage	...	...	...	...	...	...	300	volts max.
Screen Voltage	...	...	...	...	...	...	125	volts max.
Screen Dissipation	...	...	...	...	...	...	0.6	watt max.

OPERATING CHARACTERISTICS

[Suppressor Grid (g3) connected to Cathode]

Anode Voltage	100	250	250	volts
Anode Current	10.8	11.0	11.0	mA
Screen Voltage	100	100	—	volts
Series Screen Resistor	—	—	33,000	ohms
Screen Current	4.4	4.2	4.2	mA
Control Grid (g1) Voltage	-1	-1	-1	volts
Cathode Bias Resistor	68	68	68	ohms
Anode Impedance	0.25	1.5	1.5	meg.
Mutual Conductance	4.3	4.4	4.4	mA/V
Input Impedance (45 Mc/s)	4,500	4,500	4,500	ohms
Input Impedance (90 Mc/s)	900	900	900	ohms
Control Grid Voltage	-21	-21	-51	volts

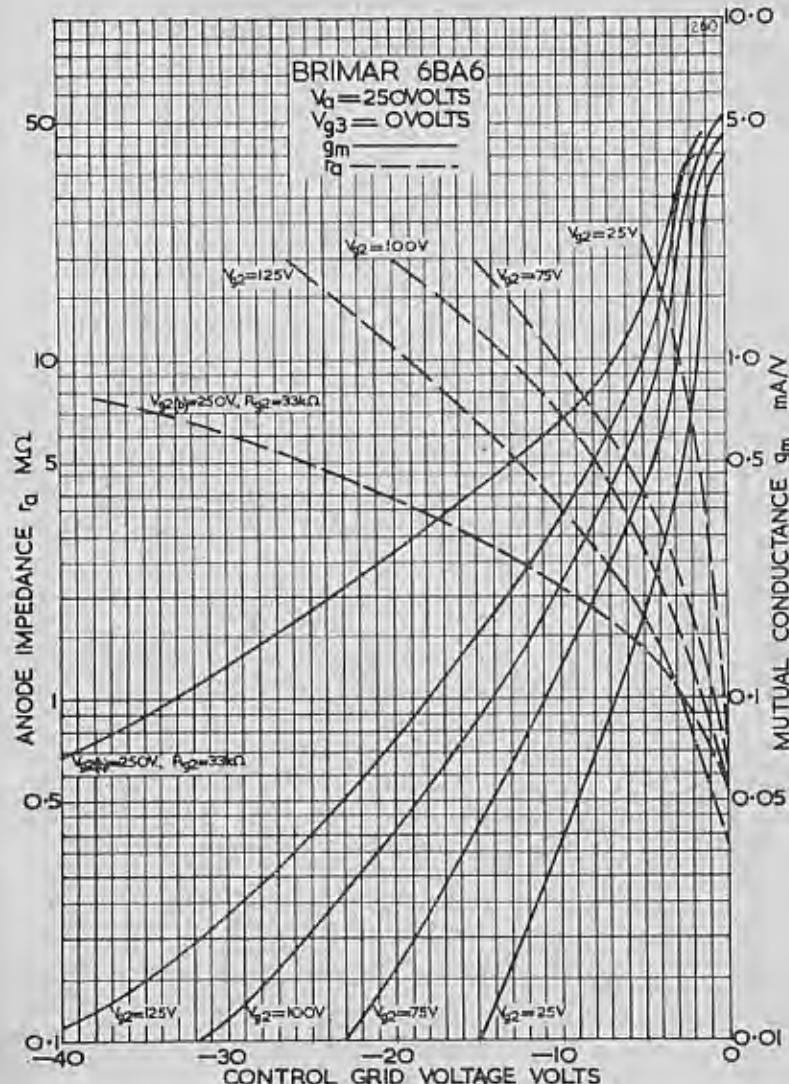
(For Mutual Conductance of 0.005 mA/V).

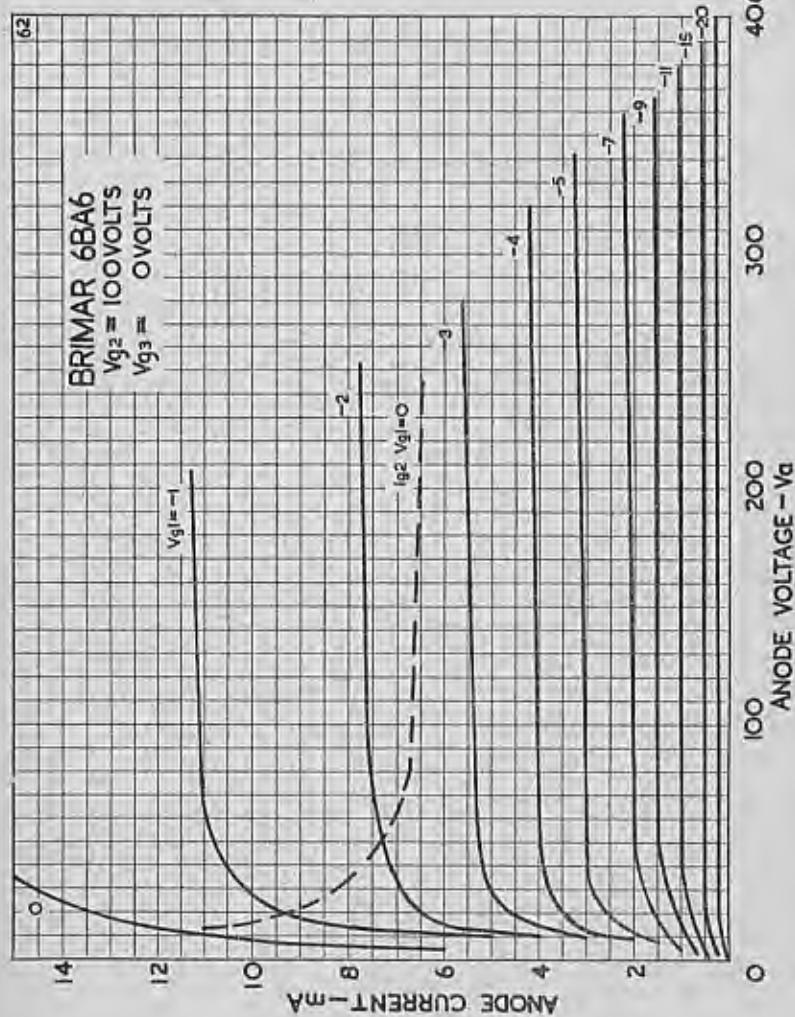
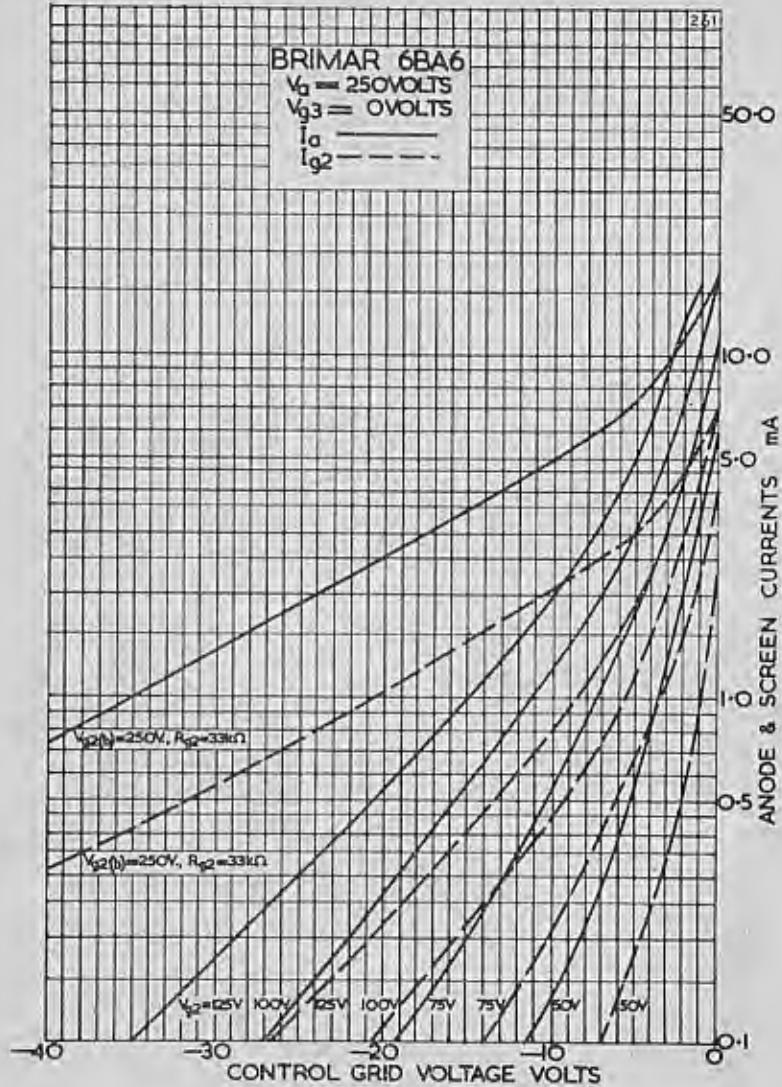
INTER-ELECTRODE CAPACITANCES*

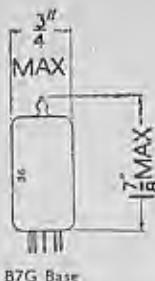
Input...	...	...	...	...	...	...	5.5	pF
Output ...	...	...	...	...	...	...	5.0	pF
Grid to Anode	...	...	...	...	...	...	0.0035	pF max.

* With no external shield

Type 6BA6 is a commercial equivalent of the CV454.







Current Equipment Type

TYPE 6BE6
MINIATURE
HEPTODE
FREQUENCY
CHANGER



B7G Base

Owing to its specialized structure, type 6BE6 may be employed as a self-oscillating frequency changer at frequencies exceeding 60 Mc/s, with excellent frequency stability.

RATINGS

Heater Voltage	...	...	...	...	...	6.3 volts
Heater Current	...	...	...	...	...	0.3 amp.
Anode Voltage	...	...	...	...	...	300 volts max.
Anode Dissipation	...	...	...	...	...	1.0 watt max.
Screen (g_2 - g_4) Voltage	...	...	...	...	...	100 volts max.
Screen Dissipation	...	...	...	...	...	1.0 watt max.
Total Cathode Current	...	...	...	...	...	14 mA max.

OPERATING CHARACTERISTICS (SEPARATE EXCITATION)

Anode Voltage	...	...	...	...	...	250 volts
Anode Current	...	...	...	...	...	3.0 mA
Screen Voltage	...	...	...	...	...	100 volts
Screen Current	...	...	...	...	...	7.1 mA
Control Grid (g_3) Voltage	...	...	...	...	...	-1.5 volts
Anode Impedance	...	...	...	...	...	1.0 meg.
Oscillator Grid (g_1) Current	...	...	...	...	...	0.5 mA
Oscillator Grid Resistor	...	...	...	...	...	20,000 ohms
Oscillator Mutual Conductance	...	...	...	...	...	7.25 mA/V
Conversion Conductance	...	...	...	...	...	0.475 mA/V†
Control Grid Voltage	...	...	...	...	...	-30 volts

(For Conversion Conductance of 0.005 mA/V).

† When used with self excitation this value depends on the position of the cathode tap-up the coil.

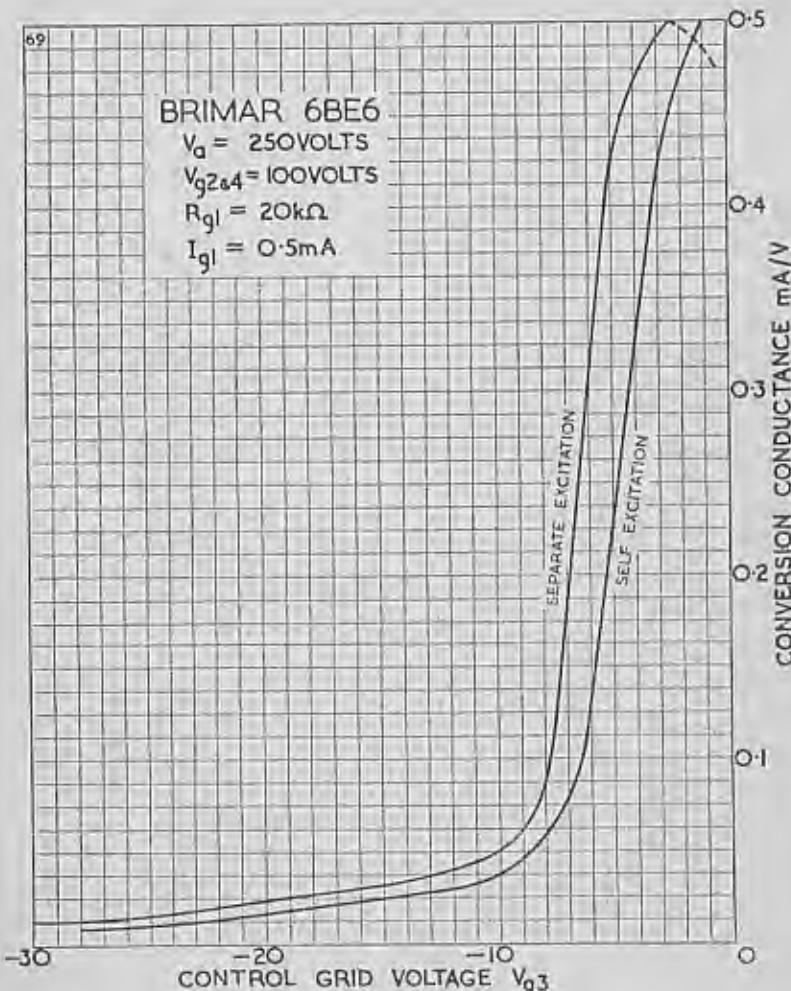
INTER-ELECTRODE CAPACITANCES *

R.F. Input	...	...	...	...	...	7.2 pF
I.F. Output	...	...	...	...	...	8.6 pF
Oscillator Input	...	...	...	...	...	5.5 pF
Control Grid to Anode	...	...	...	...	...	0.3 pF max.

* Measured with no external shield.

Note : The characteristics shown with separate excitation approximate closely to those obtained with self excitation and zero bias.

Type 6BE6 is a commercial equivalent of the CV453.





Maintenance Type

TYPE 6BG6G
(OCTAL BASE)
LINE TIME BASE
OUTPUT VALVE

RATINGS

Heater Voltage ...	... . . . .	... . . . .	6.3 volts
Heater Current ...	... . . . .	... . . . .	0.9 amp.
Direct Anode Voltage ...	... . . . .	... . . . .	700 volts max.
Positive Surge Anode Voltage ...	... . . . .	... . . . .	6,000 volts max.*
Direct Anode Current ...	... . . . .	... . . . .	100 mA max.
Anode Dissipation	... . . . .	... . . . .	20 watts max.
Direct Screen (g_2) Voltage	... . . . .	... . . . .	350 volts max.
Screen Dissipation	... . . . .	... . . . .	3.2 watts max.
Direct Control Grid (g_1) Voltage	... . . . .	... . . . .	-50 volts max.
Negative Surge Control Grid Voltage	... . . . .	... . . . .	-400 volts max.*
Control Grid to Cathode Resistance	... . . . .	... . . . .	1.0 meg. max.
Heater to Cathode Potential	... . . . .	... . . . .	250 volts max.
Peak Cathode Current ...	... . . . .	... . . . .	300 mA. max.

CHARACTERISTICS

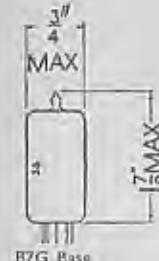
Anode Voltage ...	... . . . .	... . . . .	300 volts
Anode Current ...	... . . . .	... . . . .	60 mA
Screen Voltage ...	... . . . .	... . . . .	250 volts
Screen Current ...	... . . . .	... . . . .	4 mA
Control Grid Voltage	... . . . .	... . . . .	-18 volts
Mutual Conductance	... . . . .	... . . . .	6.0 mA/V
Anode Impedance	... . . . .	... . . . .	30,000 ohms
Inner Amplification Factor (μ_{g1g2})	... . . . .	... . . . .	8

INTER-ELECTRODE CAPACITANCES

Input ...	... . . . .	... . . . .	11 pF
Output ...	... . . . .	... . . . .	6.5 pF
Grid to Anode ...	... . . . .	... . . . .	0.5 pF max.

* The duty cycle must not exceed 15 per cent. of the scanning cycle and its duration must be limited to 15 microseconds.

Current Equipment Type

TYPE 6BH6
MINIATURE
HIGH SLOPE
R.F. PENTODE

The BRIMAR 6BH6 is a medium slope, sharp cut-off R.F. pentode designed for use in car radio and mobile equipment where economy of heater current is important.

RATINGS

Heater Voltage ...	... . . . .	... . . . .	6.3 volts
Heater Current ...	... . . . .	... . . . .	0.15 amp.
Anode Voltage ...	... . . . .	... . . . .	300 volts max.
Anode Dissipation	... . . . .	... . . . .	3.0 watts max.
Screen (g_2) Voltage	... . . . .	... . . . .	150 volts max.
Screen Dissipation	... . . . .	... . . . .	0.5 watt max.

OPERATING CHARACTERISTICS

(Suppressor Grid (g_1) connected to Cathode)

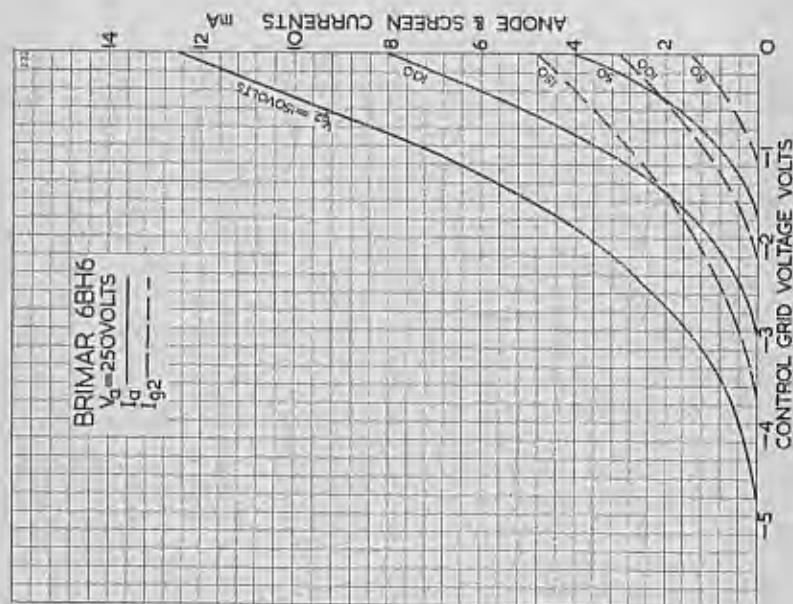
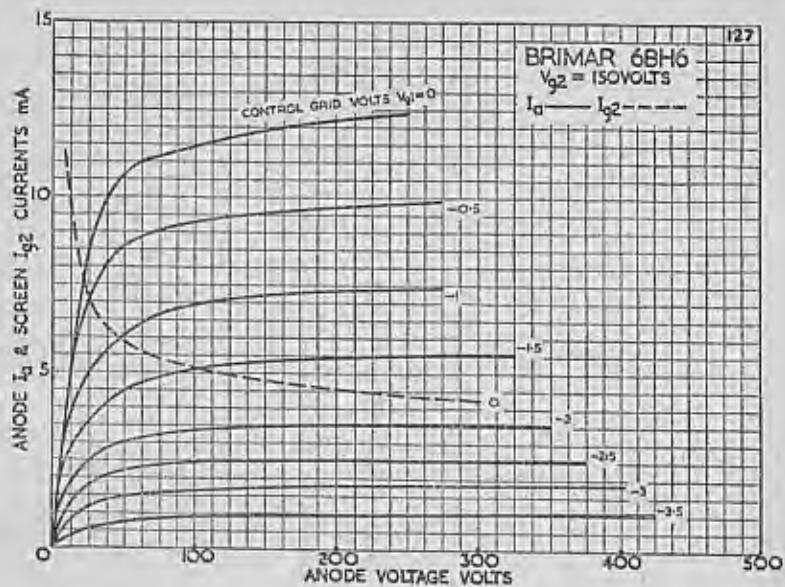
Anode Voltage ...	... . . . .	... . . . .	100	250	250	volts
Anode Current ...	... . . . .	... . . . .	3.6	7.4	7.4	mA
Screen Voltage ...	... . . . .	... . . . .	100	150	—	volts
Series Screen Resistor	... . . . .	... . . . .	—	—	33	k Ω
Screen Current ...	... . . . .	... . . . .	1.4	2.9	2.9	mA
Control Grid (g_1) Voltage	... . . . .	... . . . .	-1	-1	-1	volts
Cathode Bias Resistor	... . . . .	... . . . .	200	100	100	ohms
Anode Impedance ...	... . . . .	... . . . .	0.7	1.4	1.4	M Ω
Mutual Conductance	... . . . .	... . . . .	3.4	4.6	4.6	mA/V
Input Impedance at 50 Mc/s	... . . . .	... . . . .	—	6,000	6,000	ohms
Input Impedance at 90 Mc/s	... . . . .	... . . . .	—	3,000	3,000	ohms
Control Grid Voltage for $I_a = 10\mu A$	... . . . .	... . . . .	-5	-7.7	—	volts

INTER-ELECTRODE CAPACITANCES

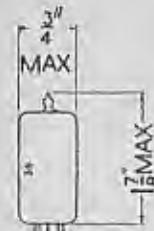
Input ...	... . . . .	... . . . .	5.4 pF
Output ...	... . . . .	... . . . .	4.4 pF
Grid to Anode ...	... . . . .	... . . . .	0.0035 pF max.

* With no external shield.

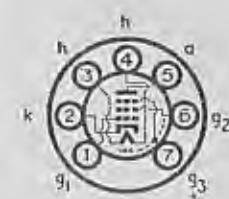
Type 6BH6 is a commercial equivalent to the CV3908.



Current Equipment Type



TYPE 6BJ6
MINIATURE
VARI-MU
R.F. PENTODE



B7G Base

The BRIMAR 6BH6 is a medium slope variable-mu R.F. pentode designed for use in domestic radio equipment. It is particularly useful for car radio and mobile equipment where economy of heater current is important.

RATINGS

Heater Voltage	...	...	...	...	...	...	6.3 volts
Heater Current	...	...	...	...	...	...	0.15 amp.
Anode Voltage	...	...	...	...	...	...	300 volts max.
Anode Dissipation	...	...	...	...	...	...	3.0 watts max.
Screen (g ₂) Voltage	...	...	...	...	...	...	125 volts max.
Screen Dissipation	...	...	...	...	...	...	0.6 watts max.

OPERATING CHARACTERISTICS(Suppressor Grid (g₃) connected to Cathode)

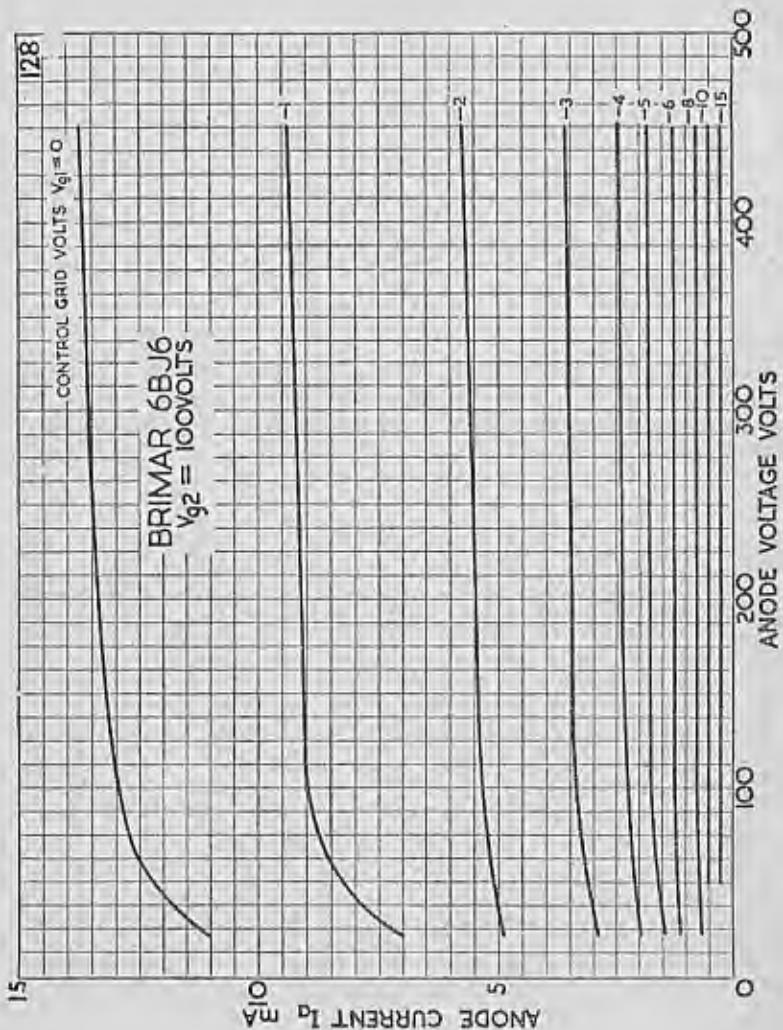
Anode Voltage	...	...	...	100	250	250	volts
Anode Current	...	...	...	9.0	9.2	9.2	mA
Screen Voltage	...	...	...	100	100	—	volts
Series Screen Resistor	...	...	...	—	—	47	kΩ
Screen Current	...	...	...	3.5	3.3	3.3	mA
Control Grid (g ₁) Voltage	...	...	...	-1	-1	-1	volts
Cathode Bias Resistor	...	...	...	82	82	82	ohms
Anode Impedance	...	...	...	0.25	1.3	1.3	MΩ
Mutual Conductance	...	...	...	3.65	3.80	3.80	mA/V
Input Impedance at 50 Mc/s	...	...	...	—	7,500	7,500	ohms
Input Impedance at 90 Mc/s	...	...	...	—	4,200	4,200	ohms
Control Grid Voltage (for gm 0.015 mA/V)	—20	—20	—	—	—	—	volts

INTER-ELECTRODE CAPACITANCES

Input	...	...	...	...	...	...	4.5 pF
Output	...	...	...	...	...	...	5.5 pF
Grid to Anode	...	...	...	...	...	...	0.0035 pF max.

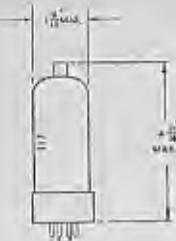
* With no external shield.

Type 6BJ6 is a commercial equivalent to the CV3909.



Current Equipment Type

TYPE 6BK4
EHT VOLTAGE
REGULATOR

**6BK4**

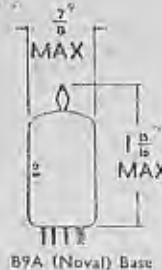
RATINGS

Heater Voltage	...	...	...	...	...	...	6.3 volts
Heater Current	...	...	...	...	...	...	0.2 amp.
Anode Voltage	...	...	...	...	...	...	25 kilovolts max.
Anode Current	...	...	...	...	...	...	1.5 mA max.
Anode Dissipation	...	...	...	...	...	...	25 watts max.
D.C. Grid Voltage	...	...	...	...	...	...	-125 volts max.
Heater-Cathode Voltage (heater-ve)	...	...	...	...	...	...	225 volts max.

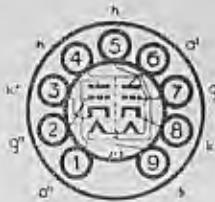
TYPICAL OPERATING CONDITIONS

Unregulated Supply Voltage	...	...	...	...	...	36 kilovolts
Supply Impedance	...	...	...	...	...	11 MΩ
Cathode Reference Voltage	...	...	...	...	...	200 volts
Reference Supply Impedance	...	...	...	...	...	1 KΩ
D.C. Anode Current, load current 0 mA	...	...	...	...	...	1,000 μA
D.C. Anode Current, load current 1 mA	...	...	...	...	...	45 μA
D.C. Output Voltage, load current 0 mA	...	...	...	...	...	25 kilovolts
D.C. Output Voltage, load current 1 mA	...	...	...	...	...	24.5 kilovolts

Free air circulation is necessary to ensure adequate cooling of the envelope. The use of anode voltages above 16 kV may produce X-rays, and prolonged exposure to the radiation may be dangerous to health. In such cases adequate shielding of the valve to reduce the radiation is essential.



Current Equipment Type

TYPE 6BQ7A
MINIATURE
HIGH SLOPE
DOUBLE TRIODE

B9A (Noval) Base

The BRIMAR 6BQ7A consists of two separate high slope triode units designed for use mainly in VHF cascode amplifiers, but since the internal screen is brought out to a separate base pin the two triode sections may be used independently or in push-pull.

RATINGS

Heater Voltage	...	...	...	...	...	...	...	6.3 volts
Heater Current	...	...	...	...	...	...	...	0.4 amp.
Anode Voltage ($I_a = 0$)	...	...	...	...	...	...	...	300 volts max.
Anode Voltage	...	...	...	...	...	...	...	250 volts max.
Anode Dissipation (per section)	...	...	...	...	...	...	...	2 watts max.
Cathode Current (per section)	...	...	...	...	...	...	...	20 mA max.
Heater-Cathode Voltage, Heater negative with respect to Cathode	...	...	...	...	...	...	...	200 volts max. [†]
Heater-Cathode Voltage, Heater positive with respect to Cathode	...	...	...	...	...	...	...	200 volts max.
Grid circuit resistance (using cathode bias)	...	...	...	...	...	...	...	500 kohms max.

[†] Under cut-off conditions in cascode circuits this may be 300 V.

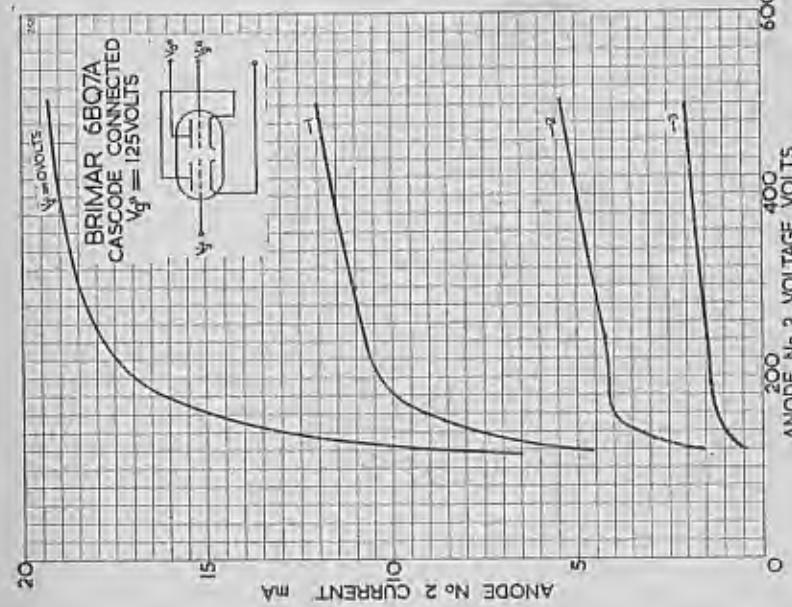
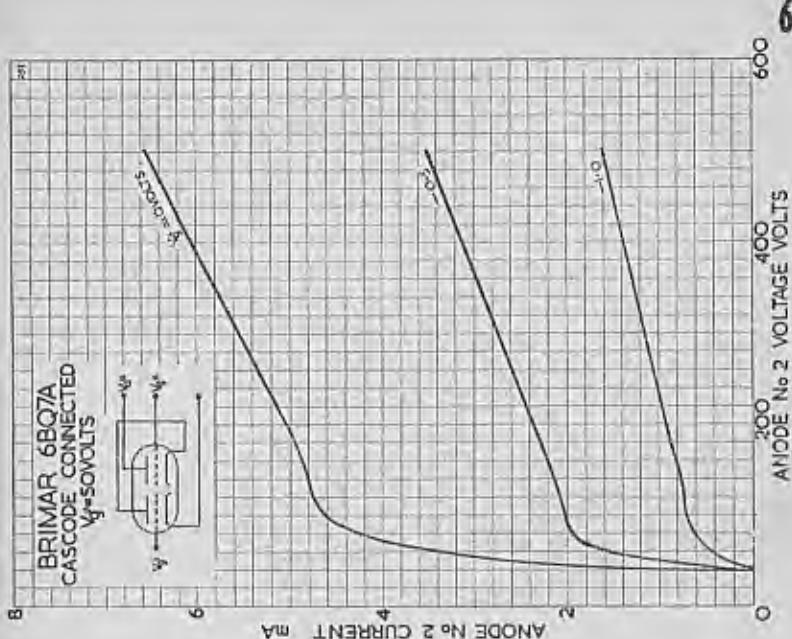
OPERATING CHARACTERISTICS

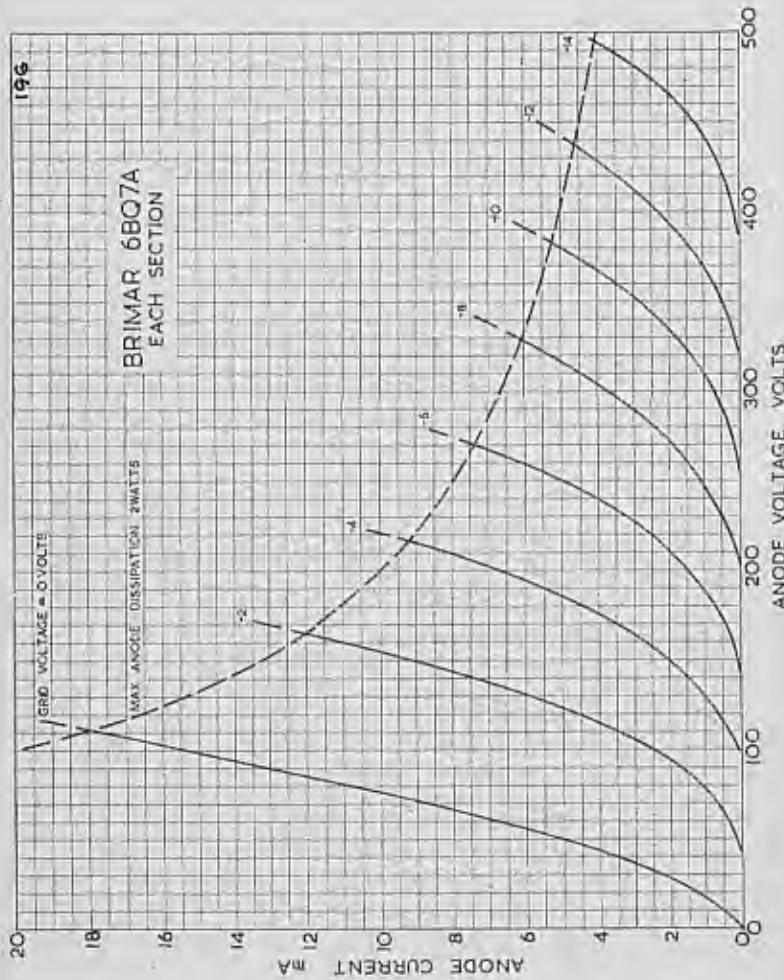
Anode Voltage	...	...	...	...	...	...	...	150 volts
Cathode Bias Resistor	...	...	...	...	...	...	...	220 ohms
Anode Current	...	...	...	...	...	...	...	9 mA
Mutual Conductance	...	...	...	...	...	...	...	6.4 mA/V
Amplification Factor	...	...	...	...	...	...	...	39
Anode Resistance	...	...	...	...	...	...	...	6,100 ohms
Control Grid Voltage for $I_a = 10 \mu A$	...	...	...	...	...	...	...	-10 volts

INTER-ELECTRODE CAPACITANCES*

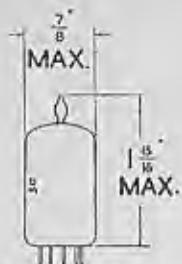
	Triode 1	Triode 2
Grid to Anode	1.15	1.15 pF
Input	2.85	— pF
Input (grounded Grid)	—	4.95 pF
Output	1.35	— pF
Output (grounded Grid)	—	2.27 pF
Anode to Cathode	0.15	0.15 pF max.
Heater to Cathode	2.65	2.70 pF
Anode to Anode	0.010	pF max.
Anode " to Anode " plus Grid	0.024	pF max.

* Measured with external shield.





Current Equipment Type


TYPE 6BQ7
MINIATURE
LOW MICROPHONY
AMPLIFIER PENTODE


B9A (Naval) Base

The BRIMAR type 6BQ7 has been specially designed for use in the early stages of high gain A.F. amplifiers. Its thorough screening and rigid construction ensure low microphony and greatly reduced hum compared with existing types.

RATINGS

Heater Voltage	...	...	...	...	...	...	...	6.3 volts
Heater Current	...	...	...	...	...	...	...	0.15 amp.
Anode Voltage	...	...	...	...	...	...	...	300 volts max.
Anode Dissipation	...	...	...	...	...	...	...	0.75 watt max.
Screen (g_2) Voltage	...	...	...	...	...	...	...	125 volts max.
Screen Dissipation	...	...	...	...	...	...	...	0.3 watt max.

 OPERATING CHARACTERISTICS
 (g_3 connected to Cathode)

Anode Voltage	...	...	...	...	...	100	250	volts
Anode Current	...	...	...	...	...	2.0	2.1	mA
Screen Voltage	...	...	...	...	...	100	100	volts
Screen Current	...	...	...	...	...	0.7	0.6	mA
Control Grid (g_1) Voltage	...	...	...	...	...	-3	-3	volts
Anode Impedance	...	...	...	...	...	1.5	2.3	meg.
Mutual Conductance	...	...	...	...	...	1.1	1.25	mA/V

OPERATION AS RESISTANCE COUPLED AMPLIFIER

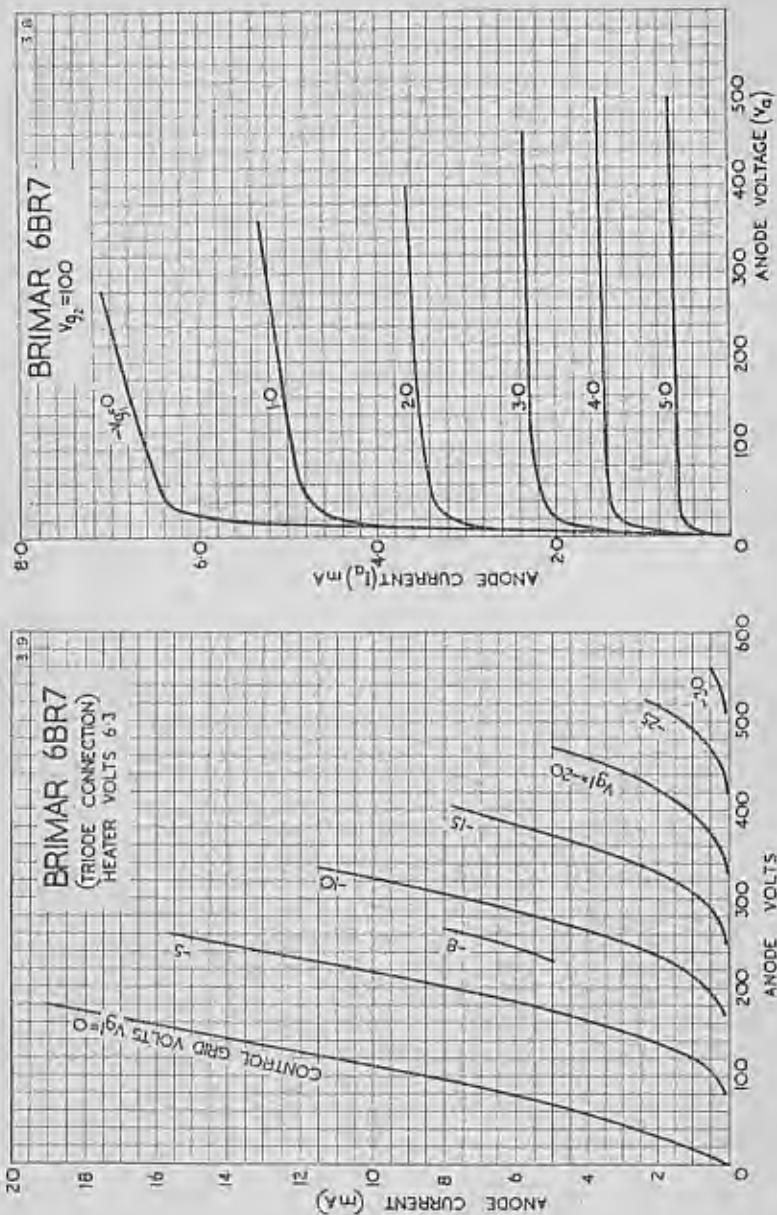
Anode and Screen Supply Voltage	...	...	100	200	300	volts
Anode Load Resistor	...	...	0.25	0.25	0.25	meg.
Screen Series Resistor	...	...	1.0	1.0	1.2	meg.
Cathode Bias Resistor	...	...	2,500	1,500	1,200	ohms
Peak Output	...	...	35	70	100	volts
Voltage Gain	...	...	90	120	140	—

INTER-ELECTRODE CAPACITANCES

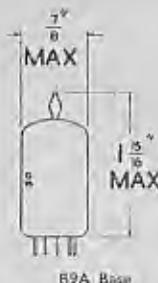
Input	...	...	...	...	...	...	...	4.0 pF
Output	...	...	...	...	...	...	...	4.0 pF
Control Grid to Anode	...	...	...	...	...	...	...	0.01 pF max.

When connected as a triode (g_3 to Cathode, g_2 to Anode), type 6BQ7 has similar characteristics to those of type 6C5G.

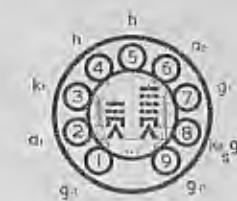
Type 6BQ7 is a commercial equivalent of the CV2135.



Current Equipment Type



TYPE 6BR8
MINIATURE
TRIODE
PENTODE



The BRIMAR 6BR8 consists of a high slope pentode and a medium-mu triode mounted in a single noval envelope. The two sections have separate cathodes, and the isolation between sections is such that the valve may be used in a variety of high-gain A.F. applications where the two stages are connected in cascade.

Heater Voltage ... 6.3 volts
Heater Current ... 0.45 amp.

RATINGS

Heater-Cathode Potential (cathode positive)	... 220 volts max.
Heater-Cathode Potential (cathode negative)	... 90 volts max.
Anode Voltage ($I_a = 0$)	... Triode 550
Anode Voltage	... Pentode 550 volts max.
Screen Voltage	... 300
Anode Dissipation	... — 300 volts max.
Screen Dissipation	... — 300 volts max.
Cathode Current	... 2.7 2.8 watts max.
Grid Resistance	... 20 0.5 watts max.
	1 20 mA max.
	1 $1 \text{ M}\Omega$ max.

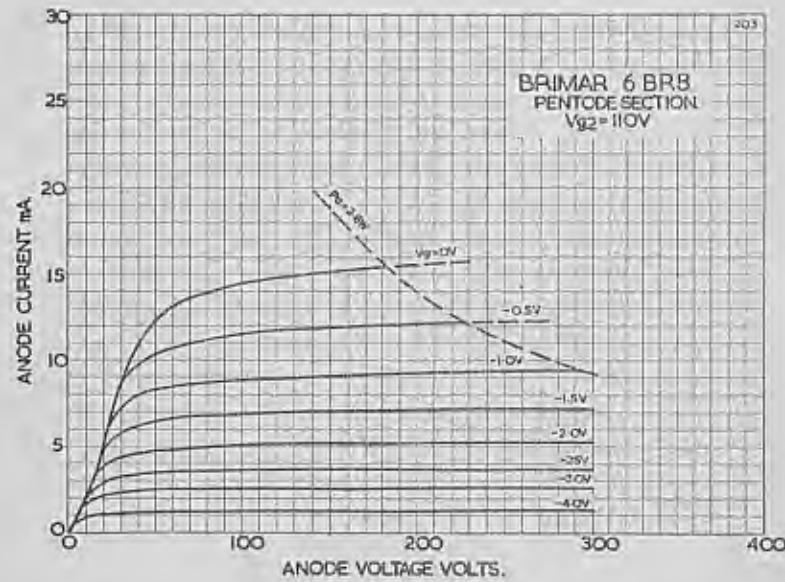
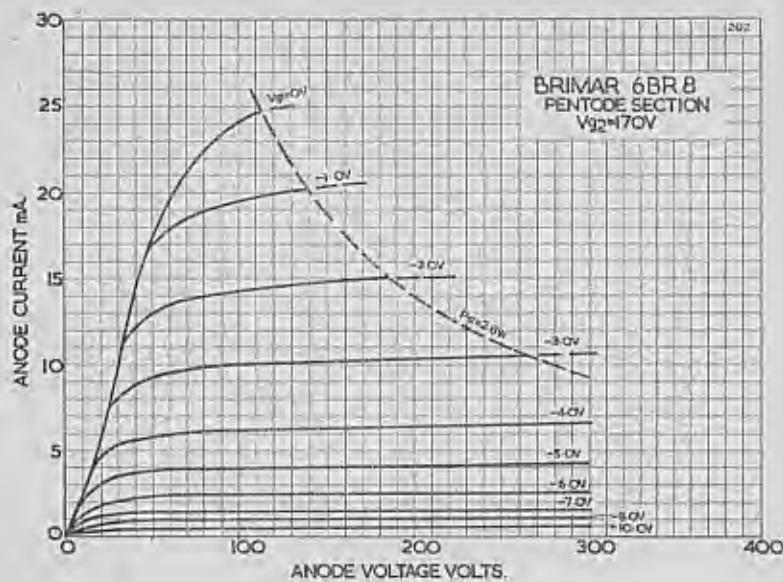
CHARACTERISTICS

	Triode	Pentode
Anode Voltage	... 150	250 volts
Screen Voltage	... 100	110 volts
Cathode Bias Resistor	... 56	$68 \text{ k}\Omega$
Anode Current	... 18	10 mA
Screen Current	—	3.5 mA
Mutual Conductance	... 8.5	5.2 mA/V
Anode Impedance	... 5	$400 \text{ k}\Omega$
Amplification Factor	... 40	—

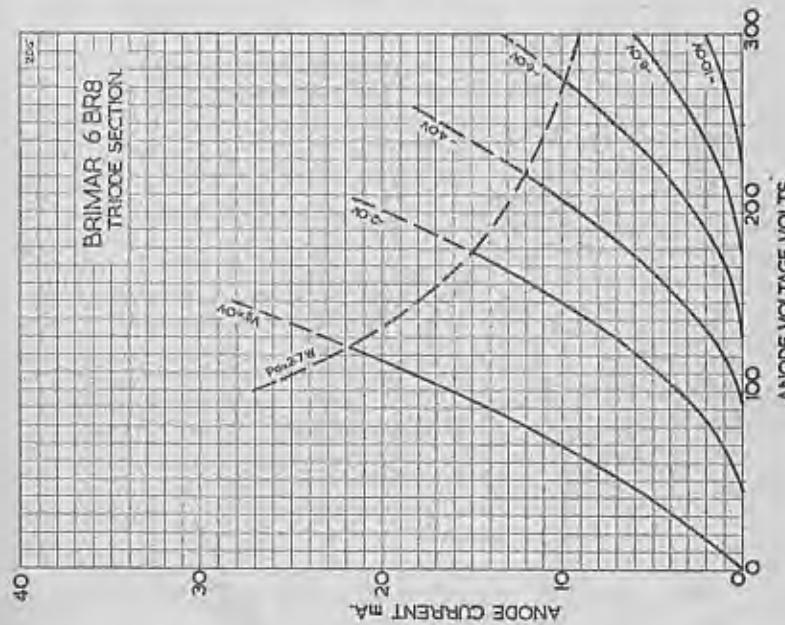
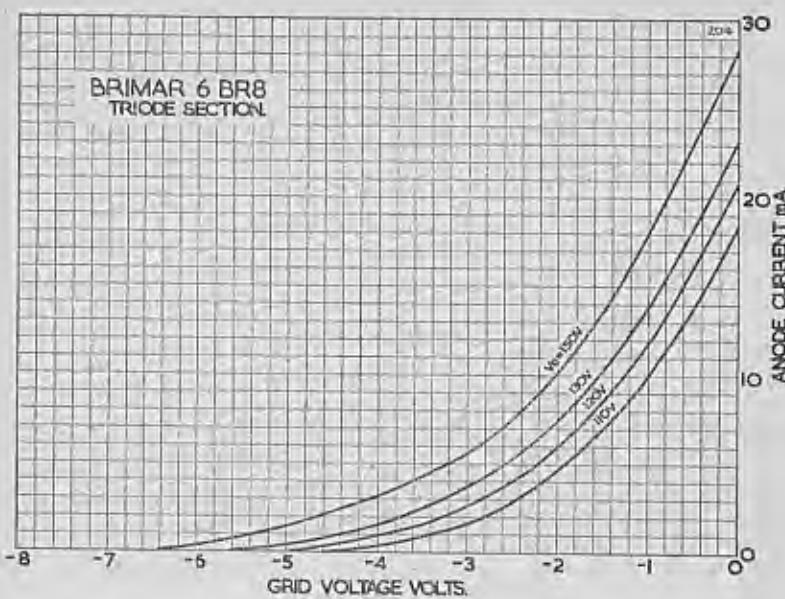
TYPICAL OPERATION AS AN R.C. COUPLED AMPLIFIER

	Triode	Pentode
Anode Supply Voltage	... 200	250 volts
Anode Load Resistor	... 47	$470 \text{ k}\Omega$
Series Screen Resistor	—	$2.7 \text{ M}\Omega$
Grid Resistor of Following Valve	... 0.22	1.0 $\text{M}\Omega$
Cathode Resistor	... 2.0	$2.2 \text{ k}\Omega$
Voltage Gain (approx.)	... 19	245

6BR8



6BR8





Current Equipment Type

TYPE 6BS7
 MINIATURE
 LOW MICROPHONY
 AMPLIFIER PENTODE


B9A (Naval) Base

The BRIMAR type 6BS7 is suitable for use in the early stages of high gain A.F. amplifiers. Its rigid construction ensures low microphony and its thorough screening, with the added feature of a top grid connection remote from heater connections, ensures a low hum level.

Properly used, the BRIMAR 6BS7 will operate satisfactorily at input levels as low as 10μ volts on its grid.

RATINGS

Heater Voltage	...	...	...	...	...	...	6.3	volts
Heater Current	...	...	...	...	...	...	0.15	amp.
Anode Voltage	...	...	...	...	...	...	300	volts max.
Anode Dissipation	...	...	...	...	...	...	0.75	watt max.
Screen (g_2) Voltage	...	...	...	...	...	...	125	volts max.
Screen Dissipation	...	...	...	...	...	...	0.3	watt max.

OPERATING CHARACTERISTICS

(g₃ connected to Cathode)

Anode Voltage	...	...	...	100	250	volts
Anode Current	...	...	...	2.0	2.1	mA
Screen Voltage	...	...	...	100	100	volts
Screen Current	...	...	...	0.7	0.6	mA
Control Grid (g ₁) Voltage	...	...	...	-3	-3	volts
Anode Impedance	...	...	...	1.5	2.3	meg.
Mutual Conductance	...	...	...	1.1	1.25	mA/V

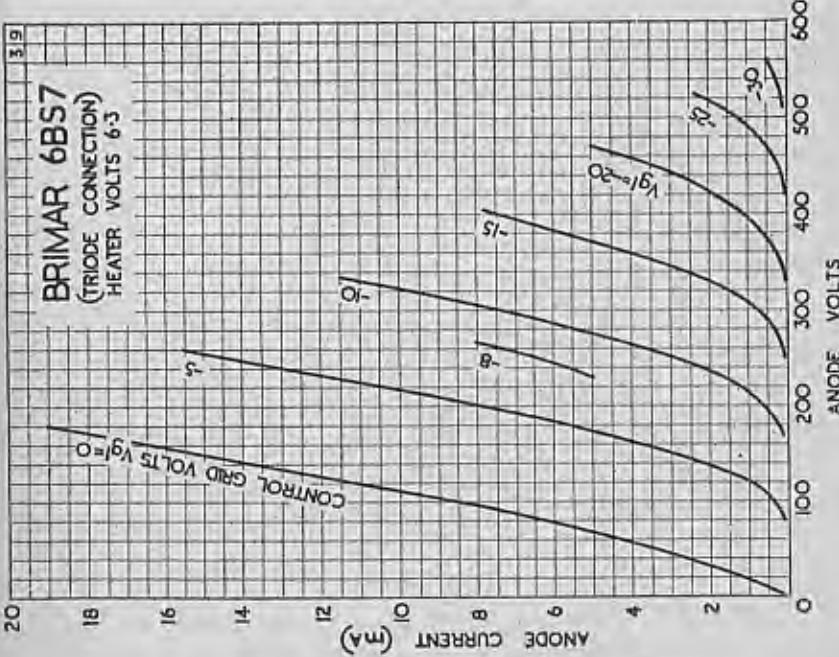
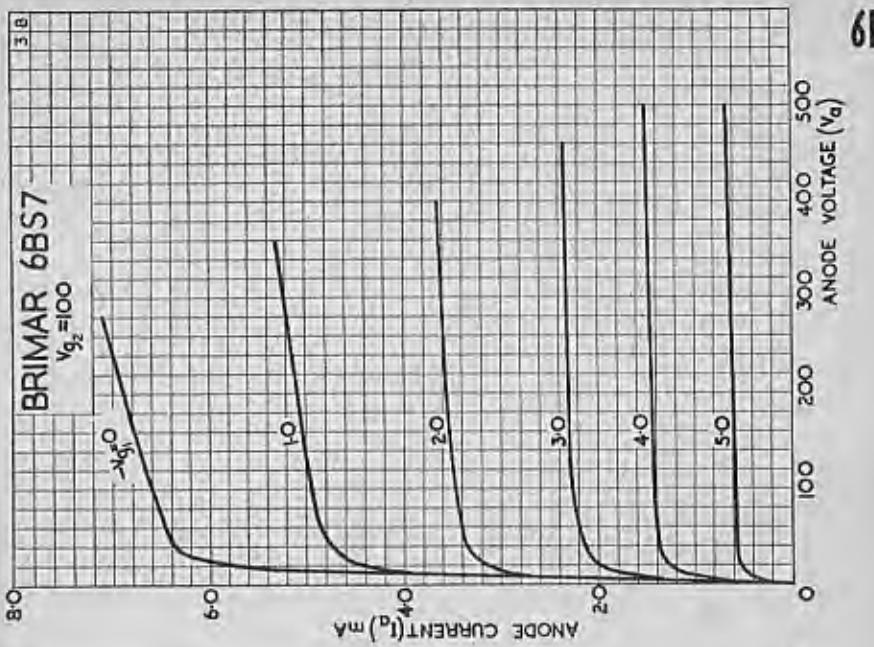
OPERATION AS RESISTANCE COUPLED AMPLIFIER

Anode and Screen Supply Voltage	...	100	200	300	volts
Anode Load Resistor	...	0.25	0.25	0.25	meg.
Screen Series Resistor	...	1.0	1.0	1.2	meg.
Cathode Bias Resistor	...	2,500	1,500	1,200	ohms
Peak Output Voltage Gain	...	35	70	100	volts
Voltage Gain	...	90	120	140	

INTER-ELECTRODE CAPACITANCES

Input	...	...	...	...	...	...	4.0	pF
Output	...	...	...	...	...	...	4.0	pF
Control Grid to Anode	...	...	...	...	...	...	0.01	pF max.

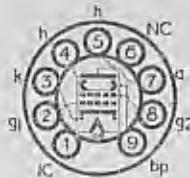
Type 6BS7 is a commercial equivalent to the CV5086.





Current Equipment Type

TYPE 6BW6
MINIATURE
OUTPUT
BEAM TETRODE



The BRIMAR type 6BW6 is a B9A (Noval) based output beam tetrode, the characteristics and ratings of which are identical to those of the 6V6G/GT. It is suitable for R.F. application up to frequencies of the order of 150 Mc/s.

Heater Voltage ... 6.3 volts
Heater Current ... 0.45 amp.

RATINGS

Anode Voltage ...	315 volts max.
Anode Dissipation	12 watts max.
Screen Voltage ...	285 volts max.
Screen Dissipation	2.0 watts max.
Hot Spot Bulb Temperature	250° C. max.
D.C. Cathode Current	65 mA max.

OPERATING CHARACTERISTICS

	Single Valve Class A		Push-Pull Class AB1 (2 valves)	
Anode Voltage ...	180	250	285	volts
Anode Current (Zero Signal) ...	29	47	70	mA
Anode Current (Max. Signal) ...	—	—	78.5	mA
Screen Voltage ...	180	250	285	volts
Screen Current (Zero Signal) ...	3.0	5	4.0	mA
Screen Current (Max. Signal) ...	—	—	10	mA
Cathode Bias Resistor ...	250	240	260	ohms
Anode Impedance	58,000	52,000	—	ohms
Mutual Conductance	3.7	4.1	—	mA/V
Optimum Load ...	5,500	5,000	8,000	ohms
Power Output ...	1.7	4.5	12	watts
Harmonic Distortion ...	7.5	8	1	per cent.

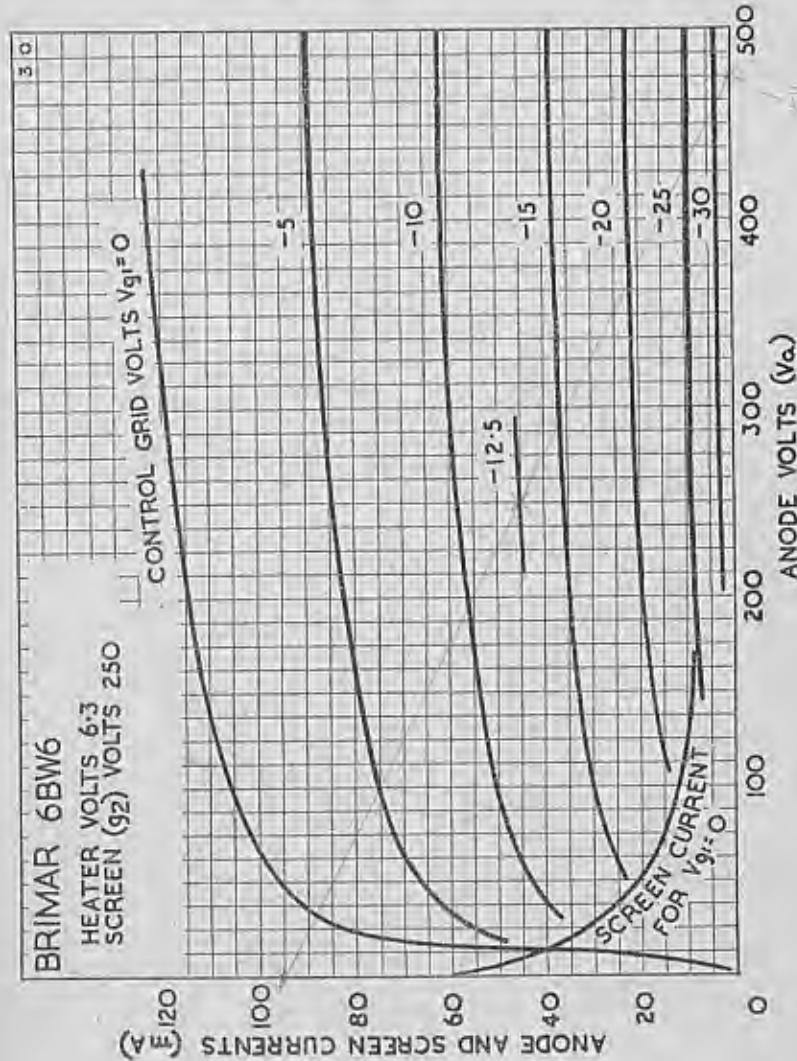
OPERATION AS A TRIODE (Anode and Screen Strapped)
CLASS A PUSH-PULL (2 Valves)

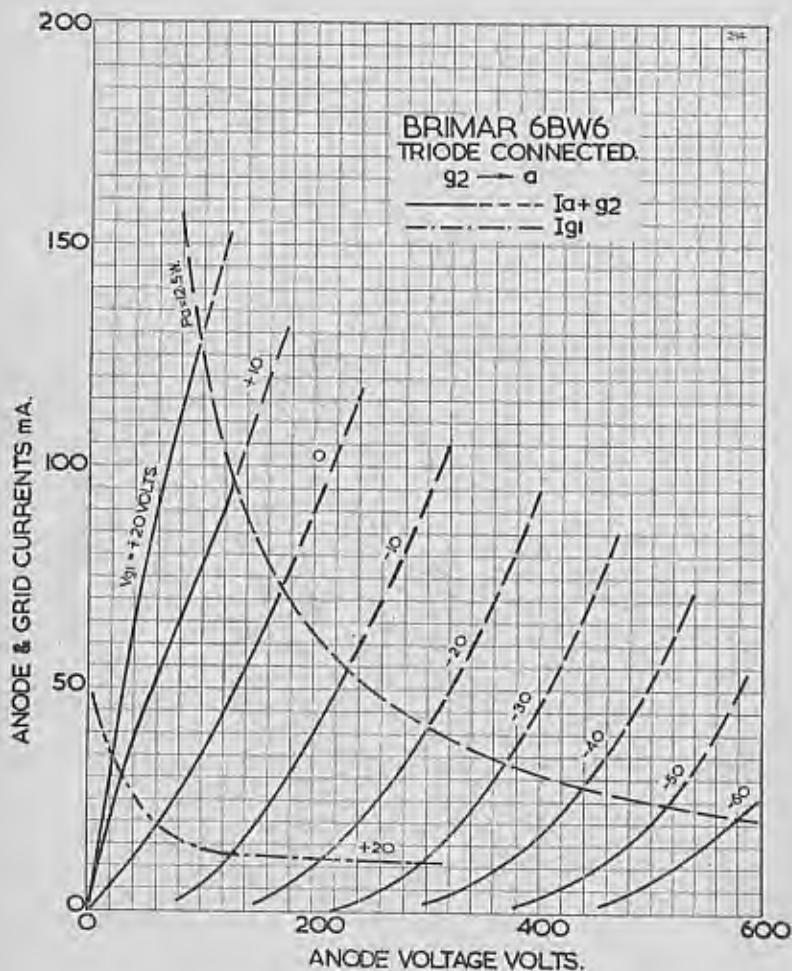
	250		285	
Anode Voltage ...	250	285	volts	
Grid Voltage ...	—13.5	—19	volts	
Cathode Bias Resistor ...	150	240	ohms	
Anode Current (no signal) ...	90	78	mA	
Optimum Load (anode-to-anode) ...	4,000	4,500	ohms	
Power Output ...	1.7	3.1	watts	
Harmonic Distortion ...	0.4	0.5	per cent.	

INTER-ELECTRODE CAPACITANCES

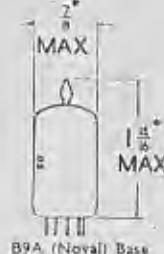
Input ...	8.5 pF
Output ...	7.5 pF
Grid to Anode ...	0.6 pF

Type 6BW6 is a commercial equivalent of the CV2136.





Current Equipment Type



TYPE 6BW7
MINIATURE
HIGH SLOPE
R.F. PENTODE



The BRIMAR 6BW7 is a high slope R.F. pentode designed for use in the R.F. Frequency Changer, I.F. and Video stages of television receivers. The valve features high mutual conductance together with a high R.F. input impedance, achieved by the use of two cathode connections. Type 6BW7 will operate from a 180 or 250 volt H.T. rail, making it suitable for both AC/DC and AC operated receivers.

RATINGS

Heater Voltage	...	...	...	...	...	...	...	6.3 volts
Heater Current	...	...	...	...	...	...	...	0.3 amp.
Anode Voltage	...	...	...	...	...	...	...	275 volts max.
Anode Dissipation	...	...	...	...	...	...	...	2.75 watts max.
Screen (g ₂) Voltage	...	...	...	...	...	...	...	275 volts max.
Screen Dissipation	...	...	...	...	...	...	...	1.2 watts max.

OPERATING CONDITIONS

(Suppressor Grid (g₃) connected to Cathode)

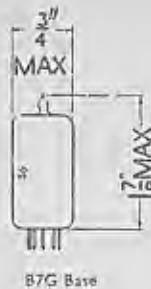
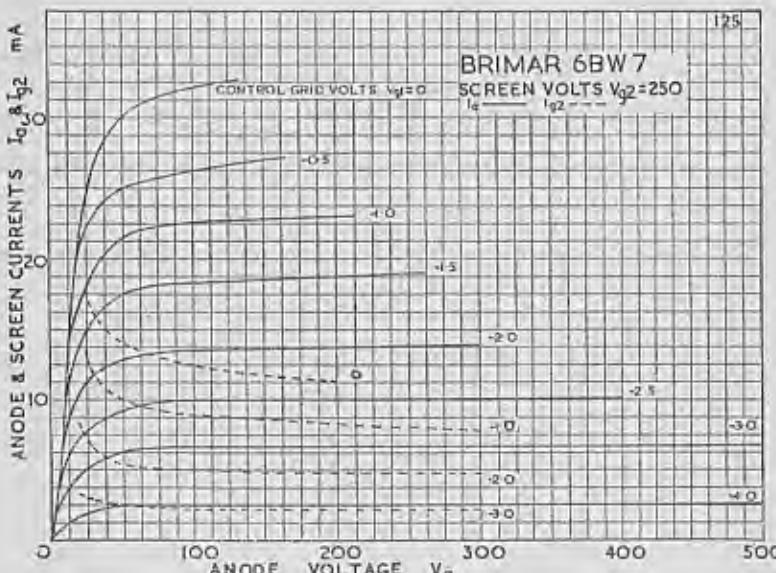
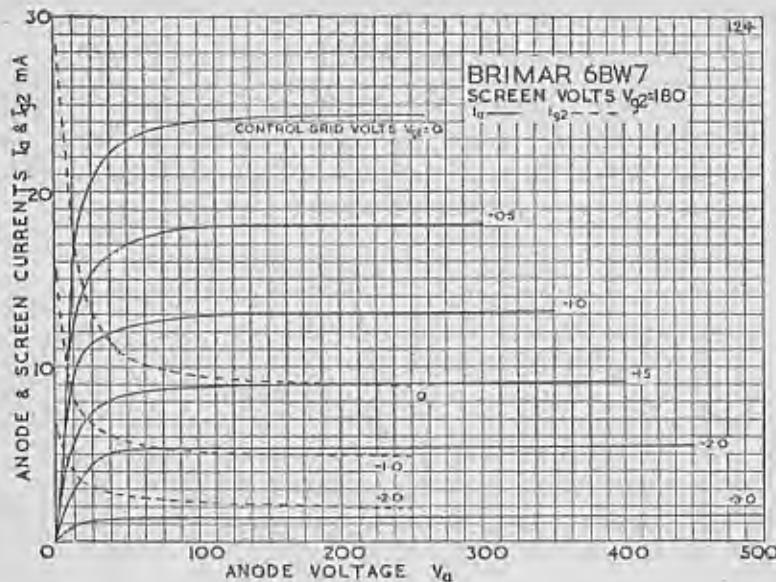
Anode Voltage	...	...	...	...	...	180	250	volts
Anode Current	...	...	...	...	...	9.5	9.5	mA
Screen Voltage	...	...	...	...	...	180	250	volts
Screen Current	...	...	...	...	...	3.5	3.5	mA
Cathode Bias Resistor	...	...	...	...	...	100	180	ohms
Mutual Conductance	...	...	...	...	...	9.3	8.5	mA/V
Anode Impedance	...	...	...	...	...	0.6	0.75	Meg.
Input Impedance at 50 Mc/s.	...	...	...	...	...	14,000	16,000	ohms
Inner Amplification Factor ($\mu_{A1, A2}$)	...	...	...	...	...	70	70	
Control Grid (g ₁) Voltage for anode current cut-off	...	...	...	...	...	-7	-8	volts

INTER-ELECTRODE CAPACITANCES

Input	...	...	...	...	...	...	...	9.5 pF
Output	...	...	...	...	...	...	...	3.5 pF
Control Grid to Anode	...	...	...	...	...	...	...	0.01 pF max.

* With no external shield.

VALVES



Current Equipment Type

TYPE 6C4
MINIATURE
H.F. POWER
TRIODE



RATINGS						
Heater Voltage	...	...	...	...	...	...
Heater Current	...	...	...	...	...	...
Anode Voltage	...	...	...	...	...	...
Anode Current	...	...	...	...	...	...
Anode Dissipation	...	...	...	...	...	...
Grid Current	...	...	...	...	...	...

OPERATING CHARACTERISTICS

Class A.

Anode Voltage	...	...	...	...	100	250	volts
Anode Current	...	...	...	...	11.8	10.5	mA
Grid Voltage	...	...	...	...	0	-8.5	volts
Anode Impedance	...	...	...	...	6,250	7,700	ohms
Mutual Conductance	...	...	...	...	3.1	2.2	mA/V
Amplification Factor	...	...	...	...	19	17	

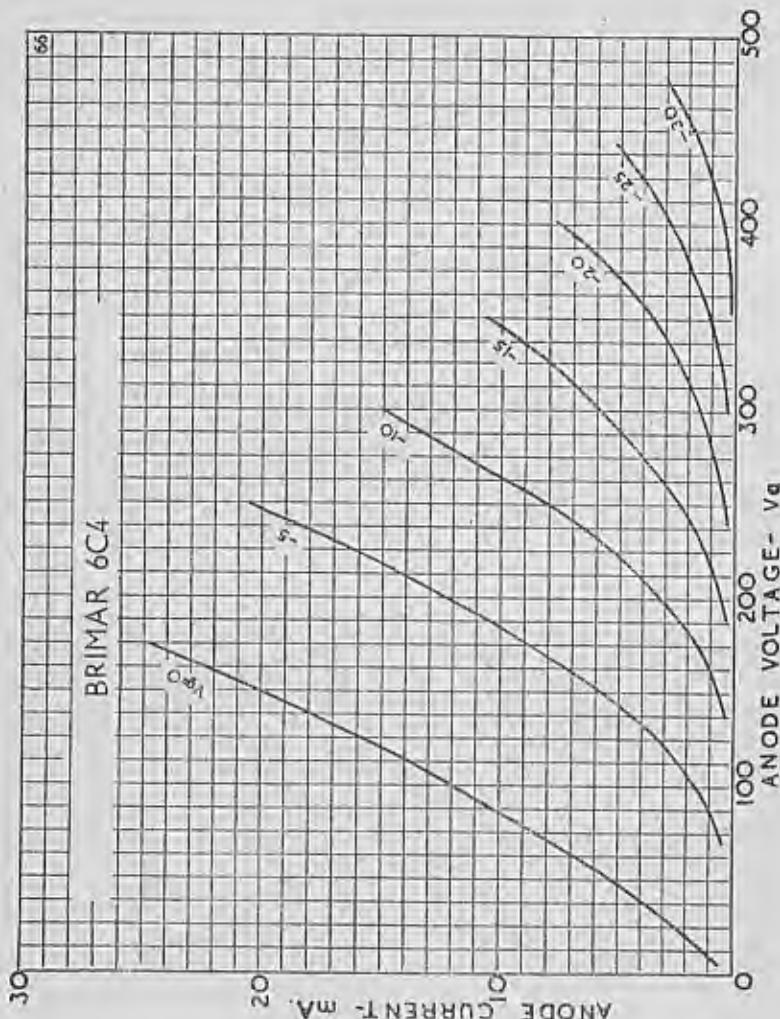
Class C Telegraphy

Anode Voltage	...	...	...	...	...	300	volts
Anode Current	...	...	...	...	...	25	mA
Grid Voltage	...	...	...	...	...	-27	volts
Grid Current (D.C.)	...	...	...	...	...	7.0	mA
Input Power	...	...	...	...	...	0.35	watt
Output Power	...	...	...	...	...	5.5	watts *

* Approximately 2.5 watts at 150 Mc/s.

INTER-ELECTRODE CAPACITANCES

	with shield	without shield
Input	...	1.8
Output	...	2.5
Grid to Anode	...	1.4



Maintenance Type



**TYPE 6CD6G
(OCTAL BASE)
LINE TIME BASE
OUTPUT VALVE**



The BRIMAR 6CD6G is designed for television line time base output service and is capable of scanning wide angle cathode ray tubes when supplied from relatively low H.T. rails, and features high anode current at low anode voltage, and a high ratio of anode to screen current.

RATINGS

Heater Voltage	... . . . .	6.3 volts
Heater Current	... . . . .	2.5 amp.
Direct Anode Voltage	... . . . .	700 volts max.
*Peak Positive Anode Pulse Voltage	... . . . .	6,600 volts max.
Anode Dissipation	... . . . .	15 watts max.
Direct Screen (S_2) Voltage	... . . . .	175 volts max.
Screen Dissipation	... . . . .	3 watts max.
Direct Control Grid (S_1) Voltage	... . . . .	-50 volts max.
*Peak Negative Control Grid Voltage	... . . . .	-200 volts max.
Heater to Cathode Potential	... . . . .	250 volts max.
Direct Cathode Current	... . . . .	200 mA max.
Peak Cathode Current	... . . . .	700 mA max.

OPERATING CHARACTERISTICS

Anode Voltage	... . . . .	200 volts
Anode Current	... . . . .	64 mA
Screen Voltage	... . . . .	150 volts
Screen Current	... . . . .	3 mA
Control Grid Voltage	... . . . .	-30 volts
Mutual Conductance	... . . . .	6.7 mA/V
Inner Amplification Factor ($\mu_{S_1-S_2}$)	... . . . .	3.5

INTER-ELECTRODE CAPACITANCES

Input (C_{in})	... . . . .	26 pF
Output (C_{out})	... . . . .	10 pF
Anode to Grid (C_{A-G})	... . . . .	1.0 pF

* The duty cycle must not exceed 15 per cent of the scanning cycle, and its duration must not exceed 15 μ seconds.



Current Equipment Type

TYPE 6CH6
MINIATURE
VIDEO OUTPUT
PENTODE

B9A (Neval) Base

The BRIMAR type 6CH6 is a miniature high slope pentode suitable for video amplification where more power is required than is obtainable from normal R.F. pentodes. Its high anode dissipation and current rating make it suitable for working into loads of low impedance and high self capacity.

RATINGS

Heater Voltage	... ...	6.3 volts
Heater Current	... ...	0.75 amp.
Anode Voltage	... ...	275 volts max.
Screen (g_2) Voltage	... ...	275 volts max.
Anode Dissipation	... ...	12 watts max.
Screen Dissipation	... ...	2.5 watts max.
D.C. Cathode Current	... ...	60 mA max.
Max. Peak Cathode Current (absolute)	... ...	1.5 amps.*
Max. Control Grid Circuit Resistance	... ...	0.1 meg.†

* The duration of current flow must not exceed 2μ secs. and must not be greater than 5 per cent of the duty cycle.

† This value may be increased to 220,000 ohms if autotbias is employed.

OPERATING CHARACTERISTICS

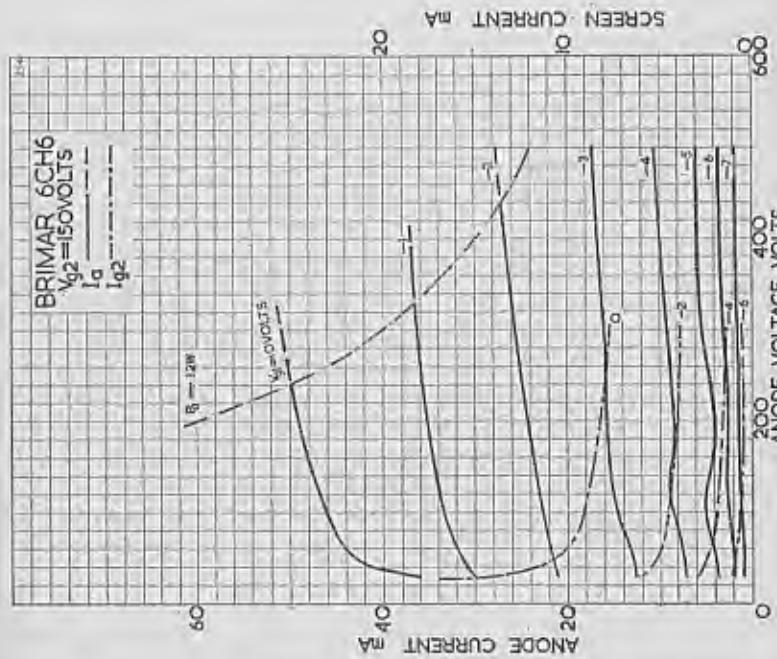
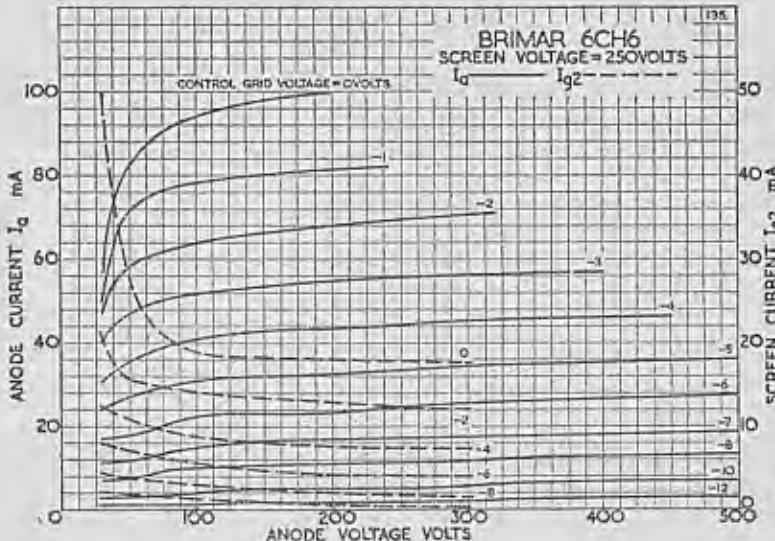
Anode Voltage	... ...	250 volts
Anode Current	... ...	40 mA
Screen Voltage	... ...	250 volts
Screen Current	... ...	6 mA
Control Grid Voltage (V_{g1})	... ...	-4.5 volts
Mutual Conductance	... ...	11 mA/V
Anode Impedance	... ...	50,000 ohms
Inner Amplification Factor (μ_{g1}, g_2)	... ...	26

INTER-ELECTRODE CAPACITANCES **

Input (C_{in})	... ...	14 pF
Output (C_{out})	... ...	5 pF
Grid to Anode (C_{gA})	... ...	0.25 pF

** No external shield.

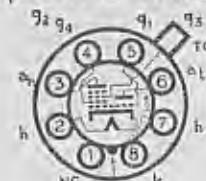
Type 6CH6 is a commercial equivalent of the CV2127.



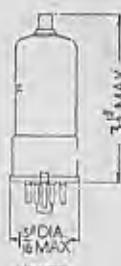


6K8G

Maintenance Types
TYPES 6K8G, 6K8GT
(OCTAL BASE)



Note.—Type 6K8GT has Pin 1 connected to metal shell.



6K8GT

TRIODE-HEXODE FREQUENCY CHANGERS

The BRIMAR types 6K8G, 6K8GT are indirectly heated triode-hexode frequency changers for use in all-wave receivers. In suitable circuits satisfactory operation may be secured at frequencies higher than 60 Mc/s., whilst the high slope and low capacitances of the triode unit ensure adequate oscillation over a wide wave band. With the exceptions of overall dimensions types 6K8G and 6K8GT have identical characteristics.

RATINGS

Heater Voltage	... 6.3 volts	Hexode Screen (g_1 , g_2) Volt.	150 volts max.
Heater Current	... 0.3 amp.	Hexode Screen Dissipation	0.7 watts max.
Hexode Anode (a_2) Voltage	300 volts max.	Triode Anode (a_1) Voltage	125 volts max.
Hexode Anode Dissipation	0.75 watts max.	Triode Anode Dissipation	0.75 watts max.

Total Cathode Current ... 16 mA max.

OPERATION AS FREQUENCY CHANGER

Hexode Anode Voltage	... 100	250	volts
Hexode Anode Current	... 2.3	2.5	mA
Hexode Screen Voltage	... 100	100	volts
Hexode Screen Current	... 6.2	6.0	mA
Hexode Control Grid (g_1) Voltage	... -3	-3	volts
Cathode Bias Resistor	... 220	300	ohms
Hexode Anode Impedance	... 0.4	0.6	meg.
Triode Anode Supply Voltage	... 100	250	volts
Triode Anode Voltage	... 100	100	volts
Triode Anode Resistor	... —	40,000	ohms
Triode Anode Current	... 3.8	3.8	mA
Triode Grid (g_1) Resistor	... 50,000	50,000	ohms
Triode Grid Current	... 0.15	0.15	mA
Conversion Conductance	... 0.33	0.36	mA/V
Hexode Control Grid Voltage	... -30	-30	volts

(For conversion conductance of 0.002 mA/V)

INTER-ELECTRODE CAPACITANCES

R.F. Input (g_1 to all except a_2)	... ...	4.6	pF
I.F. Output (a_2 to all except g_1)	... ...	4.8	pF
Oscillator Input (g_1 to all except a_1)	... ...	6.5	pF
Oscillator Output (a_1 to all except g_1)	... ...	3.4	pF
Control Grid (g_2) to Oscillator Grid (g_1)	... ...	0.2	pF max.
Control Grid (g_2) to Oscillator Anode (a_1)	... ...	0.05	pF max.
Control Grid (g_2) to Hexode Anode (a_2)	... ...	0.08	pF max.
Oscillator Grid (g_1) to Oscillator Anode (a_1)	... ...	1.8	pF

* With close fitting shield connected to Cathode.

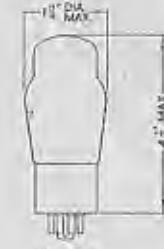
Maintenance Types
TYPES 6L6G, 6L6GA
(OCTAL BASE)



6L6G



OUTPUT BEAM TETRODES



6L6GA

BRIMAR types 6L6G, 6L6GA are indirectly heated beam power tetrodes for use in the output stages of large audio equipment. Owing to the special construction only a small proportion of odd harmonics are produced and in push-pull connection large outputs may be obtained with low distortion.

RATINGS

Heater Voltage	... ...	... ...	... ...	6.3 volts
Heater Current	... ...	... ...	... ...	0.9 amp.
Anode Voltage	... ...	... ...	... ...	360 volts max.
Anode Dissipation	... ...	... ...	... ...	19 watts max.
Screen (g_2) Voltage	... ...	... ...	... ...	270 volts max.
Screen Dissipation	... ...	... ...	... ...	2.5 watts max.

OPERATING CHARACTERISTICS

	CLASS A	CLASS AB1
Single Valve	Push-Pull (2 valves)	Push-Pull (2 valves)
Anode Voltage	250	360
Anode Current (Zero Signal)	72	54
Anode Current (Max. Signal)	79	66
Screen Voltage	250	250
Screen Current (Zero Signal)	5.0	2.5
Screen Current (Max. Signal)	7.3	7.0
Control Grid (g_1) Voltage	-14	-18
Cathode Bias Resistor	170	300
Anode Impedance	22,500	33,000
Mutual Conductance	6.0	5.2
Optimum Load	2,500	4,200
Power Output	6.5	11
Harmonic Distortion	10	15

OPERATION AS TRIODE (g_2 connected to Anode) CLASS A, PUSH-PULL (2 Valves)

Anode Voltage	... ...	... ...	325 volts max.
Anode Current	... ...	... ...	80 mA
Cathode Bias Resistor	... ...	... ...	375 ohms
Optimum Load	... ...	... ...	8,000 ohms
Power Output	... ...	... ...	6 watts
Harmonic Distortion	... ...	... ...	0.6 per cent.

INTER-ELECTRODE CAPACITANCES

Input	... ...	... ...	11.5 pF
Output	... ...	... ...	9.5 pF
Control Grid to Anode	... ...	... ...	0.9 pF

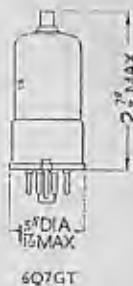
Type 6L6G is a commercial equivalent of the CV1947, and type 6L6GA of the CV2817.



Maintenance Types
**TYPES 6Q7G, 6Q7GT
(OCTAL BASE)**



Note.—Type 6Q7GT has Pin 1 connected to metal shell.



DOUBLE DIODE TRIODES

The BRIMAR types 6Q7G, 6Q7GT are indirectly heated double diode triodes suitable for use as detector, A.V.C. and A.F. amplifiers in radio equipment. With the exception of their overall dimensions and inter-electrode capacitances, types 6Q7G and 6Q7GT have identical characteristics.

RATINGS

Heater Voltage	...	...	...	...	...	...	...	6.3 volts
Heater Current	...	...	...	...	...	...	...	0.3 amp.
Anode Voltage	...	...	...	...	...	...	...	300 volts max.
Grid Voltage	...	...	...	...	...	...	...	0 volts min.

OPERATING CHARACTERISTICS

Anode Voltage	...	...	...	100	250	volts
Anode Current	...	...	...	0.35	1.0	mA
Grid Voltage	...	...	...	-1.5	-3	volts
Anode Impedance	...	...	...	88,000	58,000	ohms
Mutual Conductance	...	...	...	0.8	1.2	mA/V
Amplification Factor	...	...	...	70	70	

OPERATION AS RESISTANCE COUPLED AMPLIFIER

Anode Supply Voltage	...	...	100	250	250	volts
Anode Load Resistor	...	...	0.5	0.25	0.25	meg.
Grid Resistor	...	...	1.0	1.0	10	meg.
Cathode Bias Resistor	...	...	9,000	3,000	0	ohms
Peak Output	...	...	16	43	40	volts
Stage Gain	...	...	33	42	42	
Harmonic Distortion	...	...	2	1	5	per cent.

* Figures are for 12 volt peak output.

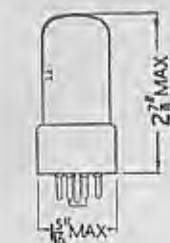
INTER-ELECTRODE CAPACITANCES†

	6Q7G	6Q7GT
Grid to Cathode	...	3.0
Anode to Cathode	...	5.0
Grid to Anode	...	1.5
Diode (1 or 2) to Cathode	...	2.2

† With close fitting shield connected to Cathode.

Maintenance Type

**TYPE 6SL7GT
(OCTAL BASE)
HIGH-MU
DOUBLE TRIODE**



The BRIMAR type 6SL7GT is an indirectly heated valve comprising two high-mu triodes in one envelope. With the exception of the heaters, the connections to each assembly are brought out to separate base pins. Type 6SL7GT may be used as A.F. amplifier or phase inverter and in certain cases the two units may be connected in cascade to give a very high overall gain.

RATINGS

Heater Voltage	...	...	...	...	...	...	...	6.3 volts
Heater Current	...	...	...	...	...	...	...	0.3 amp.
Anode Voltage	...	...	...	...	...	...	...	250 volts max.
Anode Dissipation (each Anode)	...	...	...	...	...	...	...	1.0 watts max.

OPERATING CHARACTERISTICS (Each Section)

Anode Voltage	...	...	...	...	...	...	...	250 volts
Anode Current	...	...	...	...	...	...	...	2.3 mA
Control Grid Voltage	...	...	...	...	...	...	...	-2 volts
Anode Impedance	...	...	...	...	...	...	...	44,000 ohms
Mutual Conductance	...	...	...	...	...	...	...	1.6 mA/V
Amplification Factor	...	...	...	...	...	...	...	70

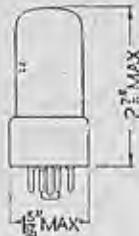
OPERATION AS RESISTANCE COUPLED AMPLIFIER (Each Section)

Anode Supply Voltage	...	...	...	...	100	250	volts
Anode Load Resistor	...	...	...	...	0.25	0.25	meg.
Cathode Bias Resistor	...	...	...	...	4,700	3,300	ohms
Peak Output	...	...	...	...	21	62	volts
Stage Gain	...	...	...	...	23	50	

INTER-ELECTRODE CAPACITANCES*

	Section (1)	Section (2)
Input	2.15	2.15 pF
Output	0.9	0.9 pF
Grid to Anode	3.4	3.5 pF
Anode 1 to Anode 2	1.4	pF
Grid 1 to Grid 2	0.25	pF
Grid 1 to Anode 2	0.45	pF
Grid 2 to Anode 1	0.35	pF

* With no external shield.



Maintenance Type
TYPE 6SN7GT
(OCTAL BASE)
LOW-MU DOUBLE
TRIODE

The BRIMAR type 6SN7GT is an indirectly heated valve comprising two general purpose triodes in one envelope. With the exception of the heaters, the connections to each assembly are brought out to separate base pins. Type 6SN7GT may be used as oscillator, A.F. amplifier, phase inverter, etc., or the two units may be connected in cascade to give a high overall gain. The operating characteristics of each section are identical to those of type 6J5GT.

RATINGS

Heater Voltage	...	...	...	...	...	...	6.3 volts
Heater Current	...	...	...	...	...	...	0.6 amp.
Anode Voltage	...	...	...	...	...	...	300 volts max.
Anode Dissipation (Each Anode)	...	...	...	...	...	...	2.5 watts max.
Average Grid Current	...	...	...	...	...	...	1.0 mA max.

OPERATING CHARACTERISTICS (Each Section)

Anode Voltage	...	...	...	...	100	250	volts
Anode Current	...	...	...	...	10.6	9.0	mA
Control Grid Voltage	...	...	...	...	0	-8	volts
Cathode Bias Resistor	...	...	...	...	—	1,000	ohms
Anode Impedance	...	...	...	...	8,000	7,000	ohms
Mutual Conductance	...	...	...	...	2.5	2.6	mA/V
Amplification Factor	...	...	...	...	20	20	

OPERATION AS RESISTANCE COUPLED AMPLIFIER (Each Section)

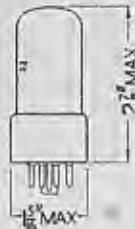
Anode Supply Voltage	...	...	100	200	300	volts
Anode Load Resistor	...	...	0.05	0.1	0.25	meg.
Cathode Bias Resistor	...	...	2,500	3,300	6,000	ohms
Peak Output	...	...	17	38	57	volts
Voltage Gain	...	...	13	14	14	

INTER-ELECTRODE CAPACITANCES†

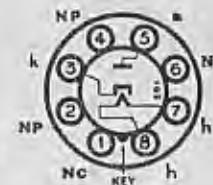
	Section (1)	Section (2)
Input	...	2.6 pF
Output	...	0.8 pF
Grid to Anode	...	4.0 pF
Anode 1 to Anode 2	...	0.5 pF
Grid 1 to Grid 2	...	0.1 pF
Grid 1 to Anode 2	...	0.2 pF
Grid 2 to Anode 1	...	0.2 pF

† With no external shield.

Maintenance Type



TYPE 6U4GT
(OCTAL BASE)
EFFICIENCY DIODE



The BRIMAR type 6U4GT is an indirectly heated half-wave rectifier designed for efficiency diode service in television receivers. The high working peak heater to cathode potential renders a separate highly insulated heater supply unnecessary when a line output transformer of the "auto" type is used.

RATINGS

Heater Voltage	...	...	...	...	...	...	6.3 volts
Heater Current	...	...	...	...	...	...	1.2 amps.
Peak Anode Current	...	...	...	...	...	...	660 mA max.
Peak Heater Cathode Potential, Heater Positive	...	...	...	...	...	...	110 volts abs. max.
Peak Heater Cathode Potential, Heater Negative	...	...	...	...	...	...	550 volts abs. max.
*Peak Heater Cathode Potential, Heater Negative	...	...	...	...	...	...	3,850 volts abs. max.
*Peak Inverse Voltage	...	...	...	...	...	...	3,850 volts max.
Direct Output Current	...	...	...	...	...	...	138 mA max.
Hot Switching Transient Anode Current for Duration of 0.2 Seconds Max.	3.85 amps. max.

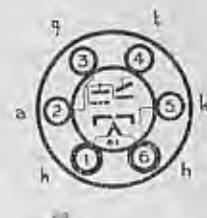
INTER-ELECTRODE CAPACITANCE

Heater to Cathode ($C_{H,C}$)	8.5 pF
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* For television efficiency diode service, where the duty cycle of the pulse does not exceed 15 per cent of the scanning cycle, and its duration does not exceed 15 micro-seconds.



Maintenance Type
TYPE 6U5/6G5
(U.X. BASE)
"MAGIC EYE"
TUNING INDICATOR



RATINGS

Anode Voltage	...	...	...	...	...	285 volts max.
Target Voltage	...	...	...	...	...	285 volts max.
Target Voltage	...	...	...	...	...	100 volts min.
Anode Dissipation	...	...	...	...	...	1.0 watts max.

OPERATING CHARACTERISTICS

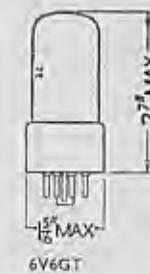
Heater Voltage	...	...	...	...	...	6.3 volts
Heater Current	...	...	...	...	...	0.3 amp
Anode Supply Voltage	...	...	100	200	250	volts
Anode Load Resistor	...	...	0.5	1.0	1.0	meg.
Anode Current*	...	...	0.2	0.2	0.24	mA
Target Voltage	...	...	100	200	250	volts
Target Current†	...	...	1	3	4	mA approx.
Grid Voltage‡	...	...	-8	-18.5	-22	volts

*For shadow angle of 90° approx., Grid Voltage zero.

†For shadow angle of 0°, Anode Current zero.



Maintenance Type
TYPES 6V6G, 6V6GT
(OCTAL BASE)



OUTPUT BEAM TETRODES

RATINGS

Heater Voltage	...	...	...	...	...	...	...	6.3 volts
Heater Current	...	...	...	...	...	...	...	0.45 amp.
Anode Voltage	...	...	...	...	...	...	...	315 volts max.
Anode Dissipation	...	...	...	...	...	...	...	12 watts max.
Screen (g_2) Voltage	...	...	...	...	...	...	...	285 volts max.
Screen Dissipation	...	...	...	...	...	...	...	2.0 watts max.

OPERATING CHARACTERISTICS

	Single Valve Class A			Push Pull Class AB1 (2 valves)	
Anode Voltage	180	250
Anode Current (Zero Signal)	29	45
Anode Current (Max. Signal)	30	47
Screen Voltage	180	250
Screen Current (Zero Signal)	3.0	4.5
Screen Current (Max. Signal)	4.0	7.0
Control Grid (g_1) Voltage	-8.5	-12.5
Cathode Bias Resistor	250	240
Anode Impedance	58,000	52,000
Mutual Conductance	3.7	4.1
Optimum Load	5,500	5,000
Power Output	2.0	4.5
Harmonic Distortion	8	8

OPERATION AS TRIODE (Anode and Screen strapped)
CLASS A. PUSH PULL (2 valves)

Anode Voltage	...	...	...	250	285	volts max.
Anode Current	...	...	...	90	78	mA
Cathode Bias Resistor	...	...	...	150	240	ohms
Optimum Load	...	...	...	4,000	4,500	ohms
Power Output	...	...	...	1.7	3.1	watts
Harmonic Distortion	...	...	...	0.4	0.5	per cent.

INTER-ELECTRODE CAPACITANCES*

Input	...	...	...	...	...	10.5 pF
Output	...	...	...	...	...	9.2 pF
Control Grid to Anode	...	...	...	...	...	1.2 pF
Heater to Cathode	...	...	...	...	...	6.0 pF

* With no external shield.



Current Equipment Type

TYPE 6X4
MINIATURE
FULL-WAVE
RECTIFIER



B7G Base

Heater Voltage 6.3 volts Heater Current 0.6 amp.

RATINGS

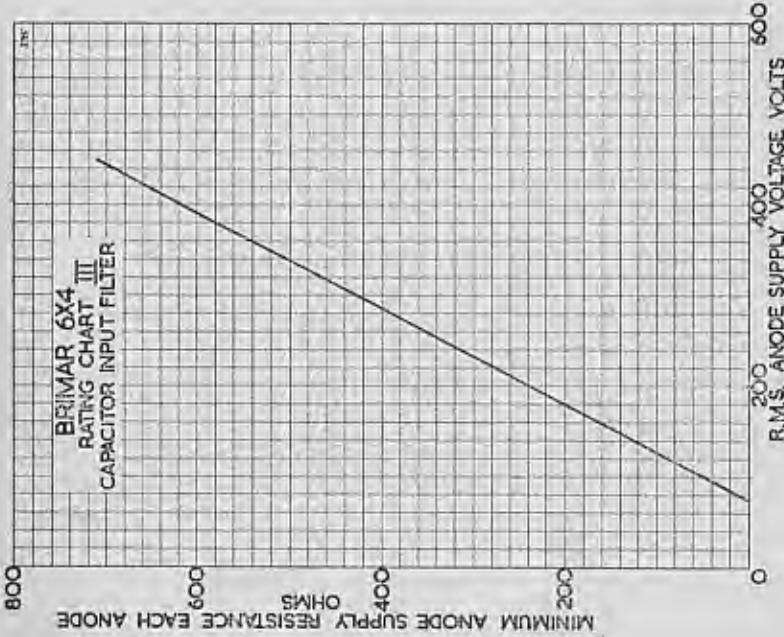
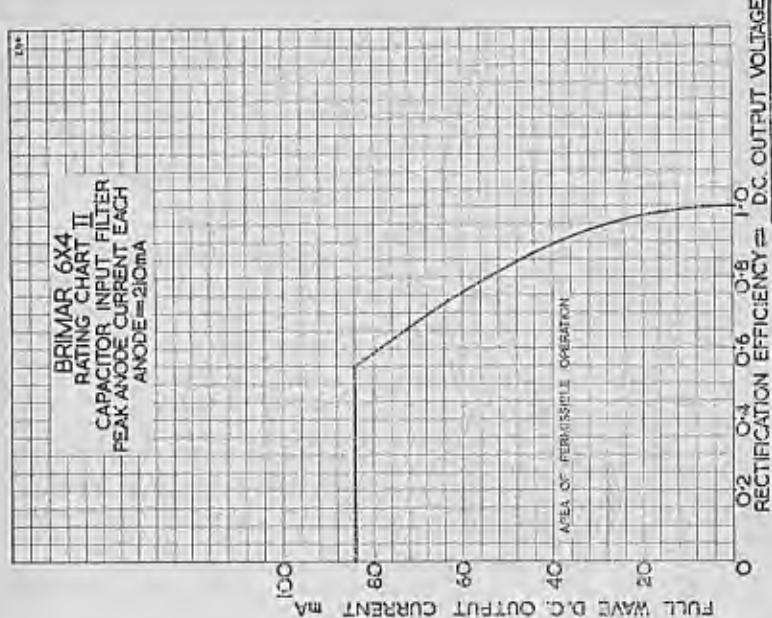
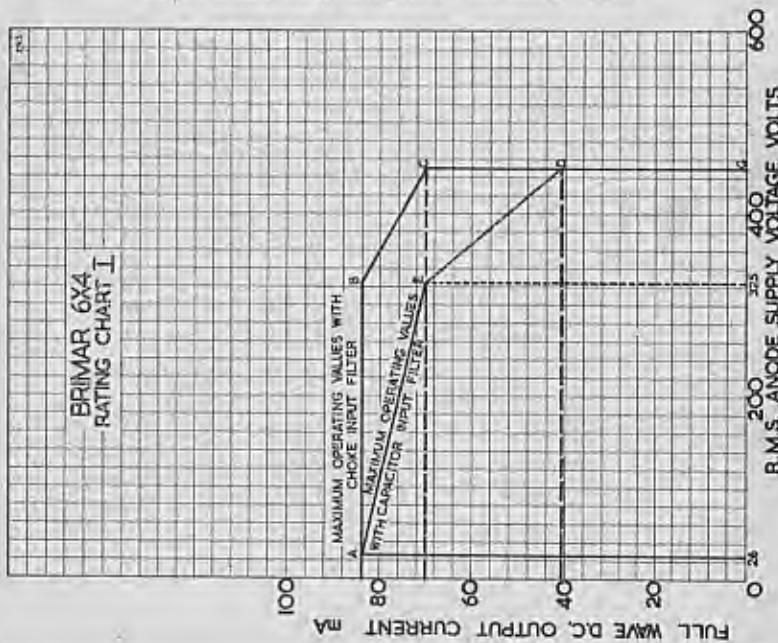
Peak Inverse Voltage	... ...	1,250 volts max.
Peak Current (each Anode)	... ...	210 mA max.
Peak Surge Current (each Anode)	... ...	750 mA max.
Anode Supply Voltage	... ...	—see Rating Chart I
D.C. Output Current	... ...	—see Rating Chart I
Peak Heater Cathode Potential	... ...	450 volts max.

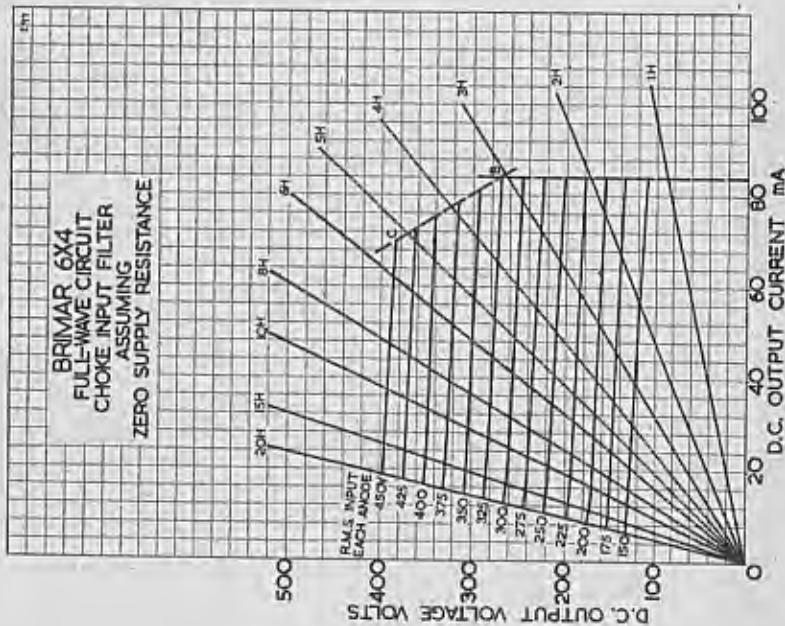
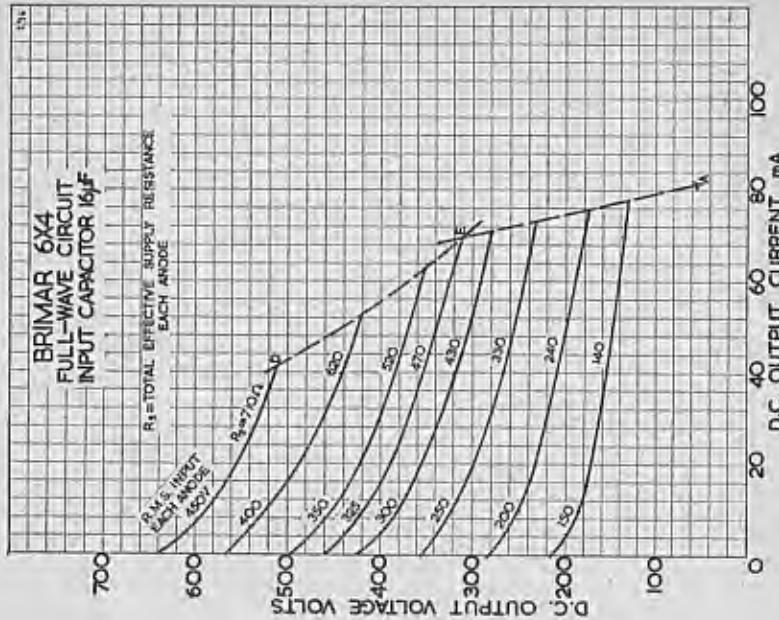
CHARACTERISTICS AS A FULL-WAVE RECTIFIER**CAPACITOR INPUT**

R.M.S. Input per Anode	... ...	325 volts	CHOKE INPUT
Rectified Current	... ...	70 mA	R.M.S. Input per Anode 450 volts
D.C. Output Voltage	... ...	310 volts	Rectified Current 70 mA
Supply Impedance per Anode	... ...	470 Ω	D.C. Output Voltage 380 volts
Reservoir Capacitor	... ...	16 μ F	Minimum Filter Input

Choked 6 Henries

† Limiting value at 62 mA. For operating currents less than 62 mA, refer to curve.
For notes on use of rating charts, refer to "Valve Ratings" section.

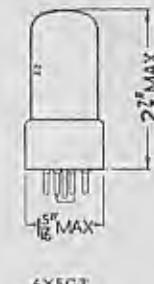
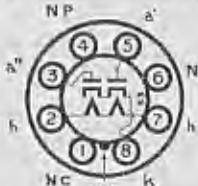




Maintenance Types

TYPES 6X5G, 6X5GT

(OCTAL BASE)

**FULL-WAVE RECTIFIERS**

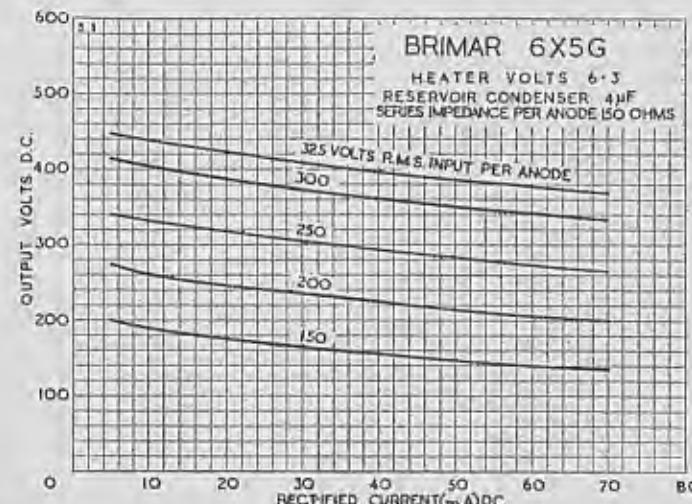
The BRIMAR types 6X5G, 6X5GT are indirectly heated full-wave rectifiers for use in equipment where the current drain does not exceed 70 mA.

RATINGS

Heater Voltage	...	...	...	...	...	...	...	...	6.3 volts
Heater Current	...	...	...	...	...	...	...	...	0.6 amp.
Peak Inverse Voltage	...	...	...	...	...	...	...	...	1,250 volts max.
Peak Current (each Anode)	...	...	...	...	...	...	...	...	210 mA max.
Heater Cathode Potential	...	...	...	...	...	...	...	...	450 volts max.

CHARACTERISTICS AS FULL-WAVE RECTIFIER**CONDENSER INPUT**

R.M.S. Input per Anode	...	...	...	...	...	...	...	325 volts max.
Supply Impedance per Anode	...	...	...	...	...	...	...	150 ohms min.
Rectified Current	...	...	...	...	...	...	...	70 mA max.
Reservoir Condenser	...	...	...	...	...	...	...	32 μ F max.





Maintenance Type
TYPE 7B7
(LOCTAL BASE)
VARI-MU R.F. PENTODE

RATINGS

Heater Voltage	... 6.3 volts	Anode Dissipation	... 2.25 watts max.
Heater Current	... 0.15 amp.	Screen (g_2) Voltage	... 100 volts max.
Anode Voltage	... 300 volts max.	Screen Dissipation	... 0.25 watt max.

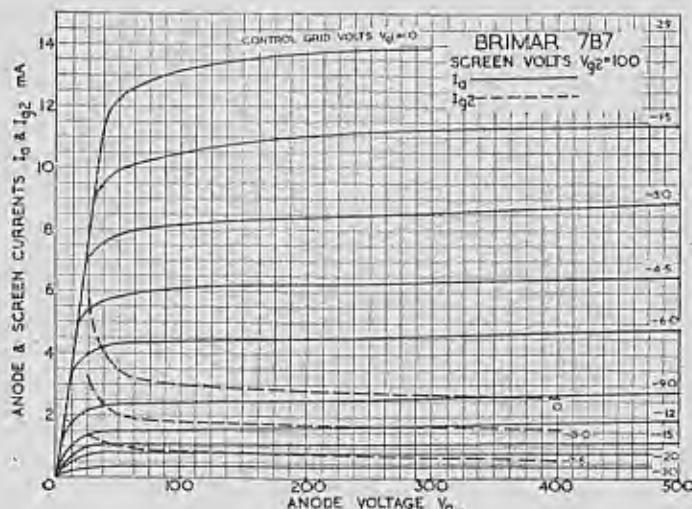
OPERATING CHARACTERISTICS

Anode Voltage	... ...	100	250	volts
Anode Current	... ...	8.1	8.5	mA
Screen Voltage	... ...	100	100	volts
Screen Current	... ...	1.8	1.7	mA
Control Grid (g_1) Voltage	... ...	-3	-3	volts
Cathode Bias Resistor	... ...	300	300	ohms
Anode Impedance	... ...	0.3	0.75	meg.
Mutual Conductance	... ...	1.65	1.75	mA/V
*Control Grid Voltage	... ...	-40	-40	volts

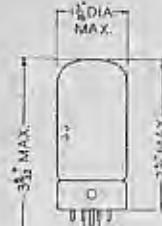
* For Mutual conductance of 0.01 mA/V.

INTER-ELECTRODE CAPACITANCES

Input	... ...	... ...	5.0	pF
Output	... ...	... ...	6.0	pF
Grid to Anode	... ...	... ...	0.007	pF



TYPE 7C5
(LOCTAL BASE)
OUTPUT BEAM TETRODE



The BRIMAR type 7C5 is an indirectly heated beam tetrode of the "all glass" construction, suitable for use in the output stages of radio receivers. The operating characteristics are identical to those of type 6V6G.

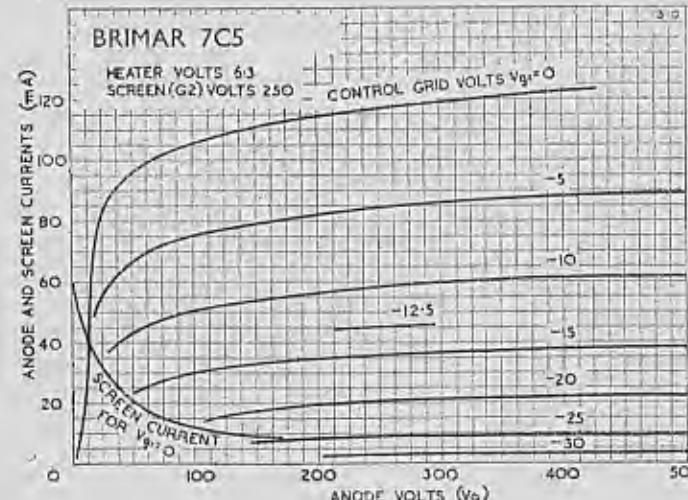
RATINGS

Heater Voltage	... ...	... ...	... ...	... ...	... ...	6.3 volts
Heater Current	... ...	... ...	... ...	... ...	... ...	0.45 amp.
Anode Voltage	... ...	... ...	... ...	... ...	... ...	315 volts max.
Anode Dissipation	... ...	... ...	... ...	... ...	... ...	12 watts max.
Screen (g_2) Voltage	... ...	... ...	... ...	... ...	... ...	285 volts max.
Screen Dissipation	... ...	... ...	... ...	... ...	... ...	2.0 watts max.

INTER-ELECTRODE CAPACITANCES (Approx.)

Input (g_1 to all except Anode)	... ...	... ...	... ...	... ...	7.5	pF
Output (Anode to all except g_1)	... ...	... ...	... ...	... ...	5.25	pF
Control Grid to Anode	... ...	... ...	... ...	... ...	0.45	pF
Heater to Cathode	... ...	... ...	... ...	... ...	4.8	pF

For operating characteristics refer to type 6V6G.





Maintenance Type
TYPE 7C6
(LOCTAL BASE)
DOUBLE DIODE TRIODE



RATINGS

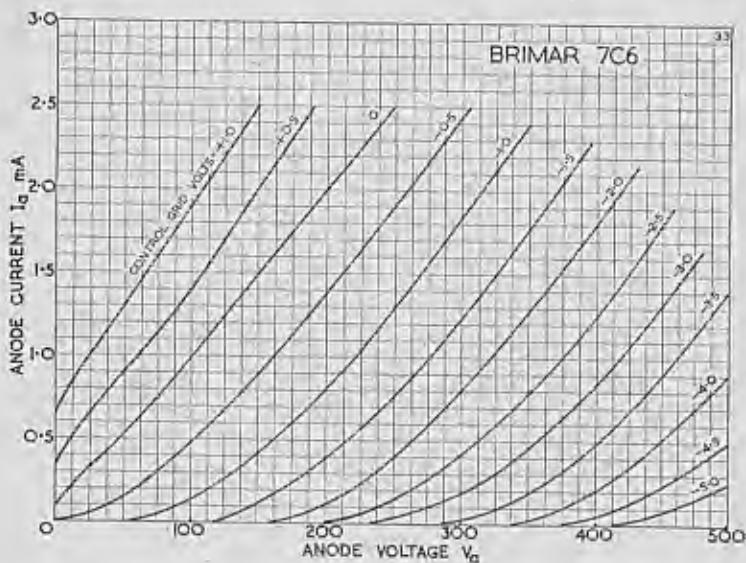
Heater Voltage	... 6.3 volts	Anode Voltage	... 300 volts max.
Heater Current	... 0.15 amp.	Diode Current	... 1.0 mA max.

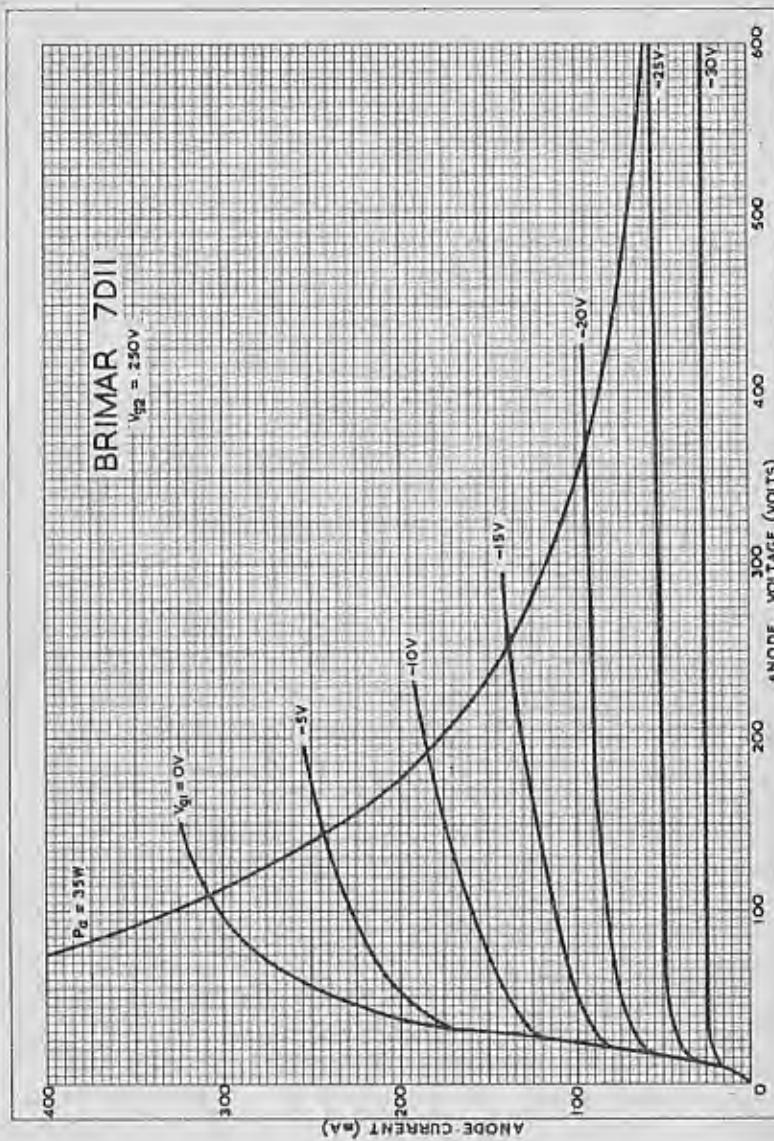
OPERATING CHARACTERISTICS

Anode Voltage	100	250	volts	Anode Impedance	0.1	0.1	meg.
Anode Current	1.0	1.3	mA	Mutual Conductance	0.95	1.0	mA/V
Grid Voltage	0	-1.0	volts	Amplification Factor	85	100	

OPERATION AS RESISTANCE CAPACITY COUPLED AMPLIFIER

Anode Supply Voltage	... 100	Anode	250	250	volts
Anode Load Resistor	...	0.47	0.27	0.27	meg.
Grid Resistor	...	1.0	1.0	10.0	meg.
Cathode Bias Resistor	...	10,000	3,300	0	ohms
Succeeding Grid Resistor	...	0.47	0.47	0.47	meg.
Peak Output Voltage	...	8.5	4.0	3.9	volts
Stage Gain	...	43	53	57	
Harmonic Distortion	...	5.0	4.8	5.0	per cent.

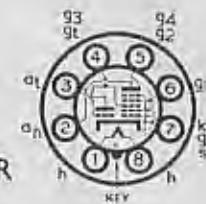




BRIMAR

Maintenance Type

TYPE 7S7
(LOCTAL BASE)
TRIODE-HEPTODE
FREQUENCY CHANGER



The BRIMAR type 7S7 is an indirectly heated triode-heptode of the "all glass" construction, fitted with a lock-in type base. Type 7S7 features high conversion, together with high anode impedance and will operate efficiently at frequencies up to 100 Mc/s.

RATINGS

Heater Voltage	...	...	...	...	...	...	6.3 volts
Heater Current	...	...	...	...	...	...	0.3 amp.
Heptode Anode Voltage	...	...	...	...	...	...	300 volts max.
Heptode Screen (g ₄ , g ₅) Voltage	...	...	...	...	...	...	100 volts max.
Triode Anode Supply Voltage	...	...	...	...	...	...	300 volts max.
Total Cathode Current	...	...	...	...	...	...	14 mA max.

OPERATING CHARACTERISTICS

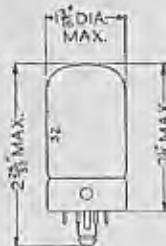
Heptode Anode Voltage	...	...	...	100	250	volts
Heptode Anode Current	...	...	...	1.9	1.8	mA
Heptode Screen Voltage	...	...	...	100	100	volts
Heptode Screen Current	...	...	...	3.0	3.0	mA
Heptode Control Grid (g ₁) Voltage	...	...	-2	-2	-2	volts
Cathode Bias Resistor	...	...	...	250	200	ohms
Heptode Anode Impedance	...	...	0.5	1.25	meg.	
Triode Anode Supply Voltage	...	...	100	250	volts	
Triode Anode Resistor	...	...	—	20,000	ohms	
Triode Anode Voltage	...	...	100	150	volts	
Triode Anode Current	...	...	3.0	5.0	mA	
Triode Grid Current	...	...	0.3	0.4	mA	
Triode Grid Resistor	...	...	50,000	50,000	ohms	
Conversion Conductance	...	...	0.5	0.53	mA/V	
Heptode Control Grid Voltage	...	...	-21	-21	volts	

(For Conversion Conductance of 0.005 mA/V)

INTER-ELECTRODE CAPACITANCES *

R.F. Input (g ₁ to all except a ₁)	...	...	...	...	5.0	pF
I.F. Output (a ₁ to all except g ₁)	...	...	...	...	8.0	pF
Oscillator Input (g ₂ to all except a ₁)	...	...	...	...	7.0	pF
Oscillator Output (a ₁ to all except g ₂)	...	...	...	...	3.5	pF
Control Grid (g ₁) to Heptode Anode (a ₂)	...	...	...	...	0.03	pF max.
Oscillator Grid (g ₂) to Oscillator Anode (a ₁)	...	...	...	...	1.0	pF

* With close fitting shield connected to Cathode.



Maintenance Type
TYPE 7Y4
(LOCTAL BASE)
FULL-WAVE RECTIFIER



The BRIMAR type 7Y4 is an indirectly heated full wave rectifier for use in equipment where the current drain does not exceed 60 mA.

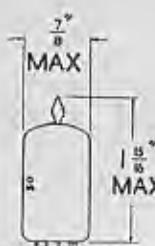
RATINGS

Heater Voltage	...	...	...	...	6.3	volts
Heater Current	...	...	...	...	0.5	amp
Peak Inverse Voltage	...	...	...	...	1250	volts max
Peak Current (Each Anode)	...	...	...	...	180	mA max
Heater Cathode Potential	...	...	...	...	450	volts max

CHARACTERISTICS AS FULL WAVE RECTIFIER

CAPACITOR INPUT

R.M.S. Input per Anode	...	...	...	...	325	volts max
Supply Impedance per Anode	...	...	...	...	150	ohms min
Rectified Current	...	...	...	...	60	mA max
Reservoir Capacitor	...	...	...	...	32	μ F max



Maintenance Type

TYPE 8D8
MINIATURE
LOW MICROPHONY
AMPLIFIER PENTODE



B9A (Noval) Base

The BRIMAR type 8D8 has been specially designed for use in the early stages of high gain A.F. amplifiers. Its thorough screening and rigid construction ensure low microphony and very low hum.

RATINGS

Heater Voltage	...	...	...	...	...	...	6.3	volts
Heater Current	...	...	...	...	...	...	0.15	amp.
Anode Voltage	...	...	...	...	...	...	300	volts max.
Anode Dissipation	...	...	...	...	...	...	1	watt max.
Screen (g_2) Voltage	...	...	...	...	...	...	200	volts max.
Screen Dissipation	...	...	...	...	...	...	0.2	watt max.

CHARACTERISTICS

(g_1 connected to cathode)

Anode Voltage	...	...	...	...	...	...	250	volts
Anode Current	...	...	...	...	...	...	3	mA
Screen Voltage	...	...	...	...	...	...	140	volts
Screen Current	...	...	...	...	...	...	0.6	mA
Control Grid (g_1) Voltage	...	...	...	...	...	...	-2	volts
Anode Impedance	...	...	...	...	...	...	2.5	M Ω
Mutual Conductance	...	...	...	...	...	...	1.9	mA/V

TYPICAL OPERATION AS RESISTANCE COUPLED AMPLIFIER

(g_1 connected to cathode)

Anode and Screen Supply Voltage	...	200	250	300	400	volts	
Anode Load Resistor	...	...	220	220	220	k Ω
Screen Series Resistor	...	...	1.0	1.0	1.0	M Ω
Cathode Bias Resistor	...	...	2.2	2.2	2.2	k Ω
Output Voltage (r.m.s.)	36	46	54	73	volts
Voltage Gain	170	180	188	200	
Following Grid Resistor	680	680	680	680	k Ω

INTER-ELECTRODE CAPACITANCES

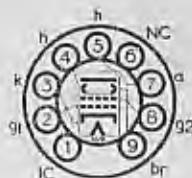
(Pentode connected; measured without external shielding)

Input	...	...	...	...	...	...	4.0	pF
Output	...	...	...	...	...	...	3.9	pF
Control Grid to Anode	...	...	...	...	...	...	0.05	pF max.
Control Grid to Heater	...	...	...	...	...	...	0.002	pF



Maintenance Type

TYPE 9BW6
MINIATURE
OUTPUT
BEAM TETRODE



The BRIMAR type 9BW6 is a B9A (Noval) based output beam tetrode, the characteristics and ratings of which are identical to those of the 6V6G/GT. It is suitable for R.F. application up to frequencies of the order of 150 Mc/s.

RATINGS

Heater Voltage	...	...	...	...	...	9.0	volts (nominal)
Heater Current	...	...	...	...	...	0.30	amp.
Anode Voltage	...	...	...	...	...	315	volts max.
Anode Dissipation	...	...	...	...	...	12.0	watts max.
Screen (g_2) Voltage	...	...	...	...	...	285	volts max.
Screen Dissipation	...	...	...	...	...	2.0	watts max.
Bulb Temperature	...	...	...	...	...	250°C.	max.
D.C. Cathode Current	...	...	...	...	...	65	mA max.

OPERATING CHARACTERISTICS

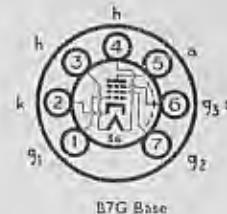
Anode Voltage	...	...	180	250	315	volts
Anode Current	...	...	29	45	34	mA
Screen Voltage	...	...	180	250	225	volts
Screen Current	...	...	3.0	4.5	2.2	mA
Control Grid (g_1) Voltage	...	...	-8.5	-12.5	-13	volts
Cathode Bias Resistor	...	...	270	250	360	ohms
Anode Impedance	...	...	58,000	52,000	77,000	ohms
Mutual Conductance	...	...	3.7	4.1	3.75	mA/V
Inner Amplification Factor (μ_{g_1, g_2})	...	—	10	—	—	—
Optimum Load	...	...	5,500	5,000	8,500	ohms
Power Output	...	...	2.0	4.5	5.5	watts
Harmonic Distortion	...	...	8.0	8.0	12	per cent.

INTER-ELECTRODE CAPACITANCES

Input	...	...	...	...	...	...	8.5	pF
Output	...	...	...	...	...	...	7.5	pF
Grid to Anode	...	...	...	...	...	...	0.6	pF

Maintenance Type

TYPE 9D6
MINIATURE
VARI-MU R.F.
PENTODE



The BRIMAR type 9D6 is an indirectly heated vari-mu R.F. pentode of "all glass" construction, fitted with a miniature type base. Owing to its relatively high slope and small physical size, type 9D6 is particularly suitable for use in the R.F. and I.F. stages of compact radio equipment.

RATINGS

Heater Voltage	...	...	...	...	...	...	...	6.3	volts
Heater Current	...	...	...	...	...	...	...	0.2	amp.
Anode Voltage	...	...	...	...	...	...	...	250	volts max.
Anode Dissipation	...	...	...	...	...	...	...	2.5	watts max.
Screen (g_2) Voltage	...	...	...	...	...	...	...	250	volts max.
Screen Dissipation	...	...	...	...	...	...	...	0.6	watt max.

OPERATING CHARACTERISTICS[Suppressor Grid (g_3) connected to Cathode]

Anode Voltage	...	...	...	...	...	...	250	250	volts
Anode Current	...	...	...	...	...	...	8.0	8.0	mA
Screen Voltage	...	...	...	...	...	...	150	200	volts
Screen Current	...	...	...	...	...	...	2.0	2.1	mA
Control Grid (g_1) Voltage	...	...	...	...	...	...	-0.65	-2.5	volts
Cathode Bias Resistor	...	...	...	...	...	...	65	250	ohms
Anode Impedance	...	...	...	...	...	...	1.0	1.0	meg.
Mutual Conductance	...	...	...	...	...	...	2.5	2.5	mA/V
Inner Amplification Factor (μ_{g_1, g_2})	...	...	...	...	...	...	—	30	—
Control Grid Voltage	...	...	...	...	...	...	-15	-28	volts

(For Mutual Conductance of 0.005 mA/V)

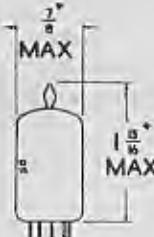
INTER-ELECTRODE CAPACITANCES

Input	...	...	...	...	...	...	...	4.5	pF
Output	...	...	...	...	...	...	...	7.0	pF
Control Grid to Anode	...	...	...	...	...	...	...	0.004	pF

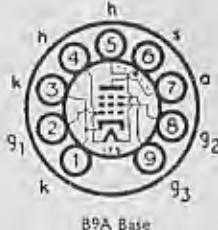
* With close fitting shield connected to Cathode.

Type 9D6 is a commercial equivalent of the CV131.

Current Equipment Type



TYPE 9D7
MINIATURE
HIGH SLOPE
VARI-MU
PENTODE



The BRIMAR 9D7 is a high slope R.F. pentode with a vari-mu characteristic for use in the I.F. stages of television and F.M. receivers using automatic gain control. It is suitable for use with both A.C. and A.C./D.C. operated receivers.

RATINGS

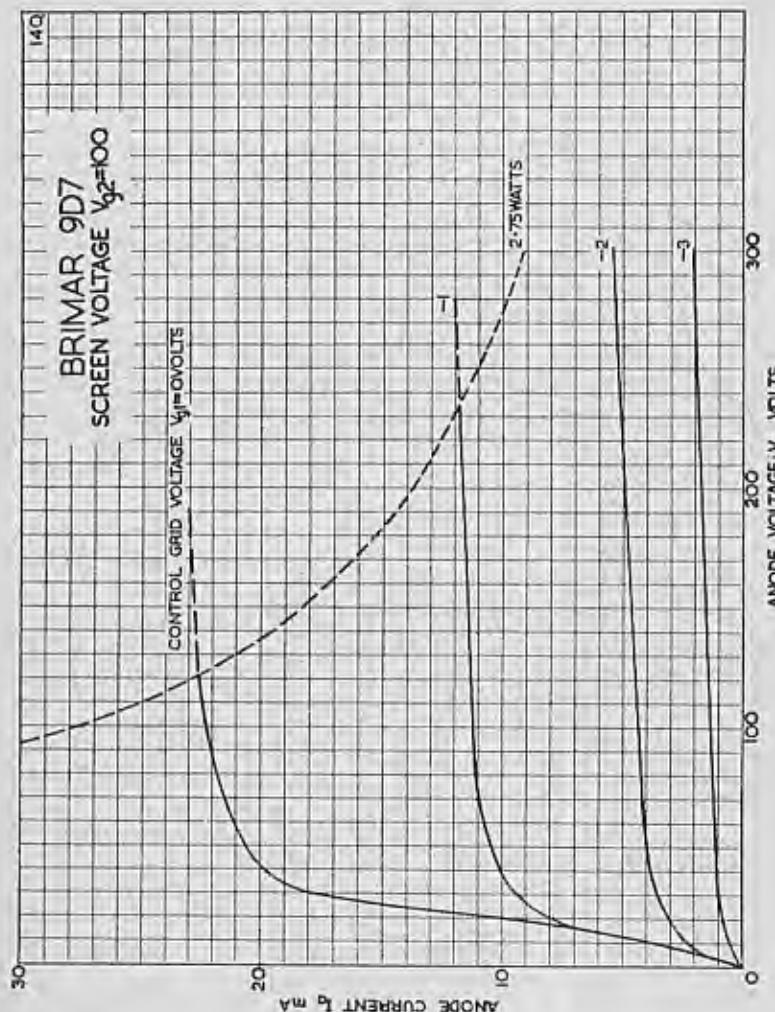
OPERATING CHARACTERISTICS

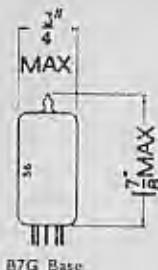
[Suppressor Grid (g_3) connected to Cathode]

Anode Voltage	...	...	...	...	...	...	250 volts
Screen Voltage	...	...	...	...	...	...	100 volts
Cathode Bias Resistor	...	...	...	...	...	...	100 ohms
Anode Current	...	...	...	...	...	...	10 mA
Screen Current	...	...	...	...	...	...	3.3 mA
Mutual Conductance	...	...	...	...	...	...	8.4 mA/V
Anode Impedance	...	...	...	...	...	...	750 kilohms
Inner Amplification Factor (μ_{g1-g2})	...	...	...	...	...	...	35
Mutual Conductance at $V_{gr} = -20V$	...	...	...	...	...	...	7 μ A/V

INTER-ELECTRODE CAPACITANCES*

* With no external shield.





Current Equipment Type

TYPE 12AC6
MINIATURE VARI-MU PENTODE

The BRIMAR 12AC6 is a vari-mu pentode for use in car radio receivers for operation direct from the 12-volt battery without the use of a vibrator H.T. system. It is designed to operate over the range of voltage variation normally encountered with car batteries.

RATINGS

Heater Voltage	... ...	... ...	... ...	... ...	... ...	12.6 volts
Heater Current	... ...	... ...	... ...	... ...	... ...	0.15 amp.
Anode Voltage	... ...	... ...	... ...	... ...	... ...	30 volts max.
Screen Voltage	... ...	... ...	... ...	... ...	... ...	30 volts max.
Grid 1 Circuit Resistance	... ...	... ...	... ...	... ...	... ...	2.2 MΩ max.
Cathode Current	... ...	... ...	... ...	... ...	... ...	20 mA max.
Heater-Cathode Voltage	... ...	... ...	... ...	... ...	... ...	±30 volts max.

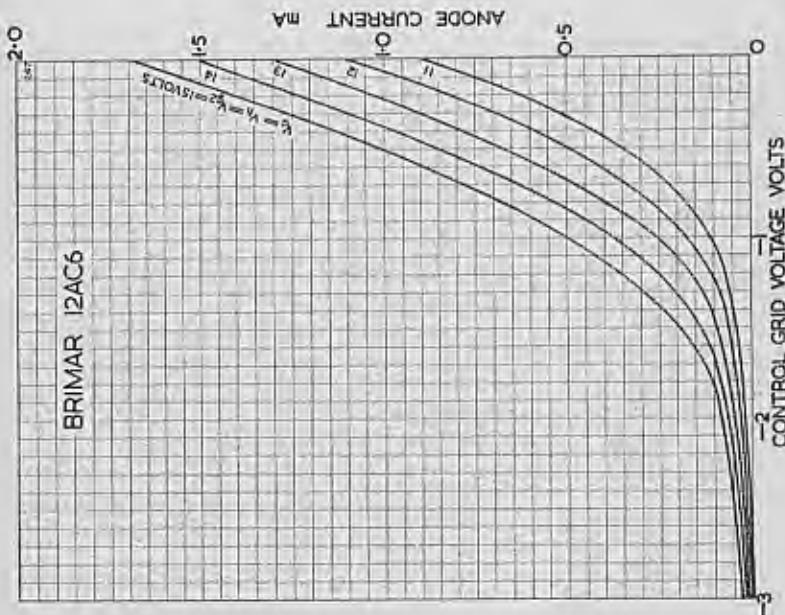
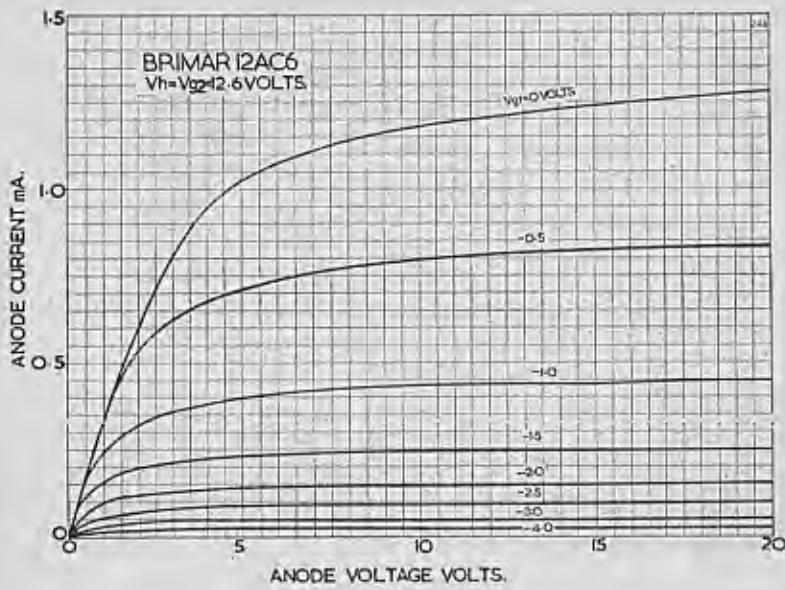
OPERATING CHARACTERISTICS *

Anode Voltage	... ...	... ...	... ...	... ...	... ...	12.6 volts
Screen Voltage	... ...	... ...	... ...	... ...	... ...	12.6 volts
Control Grid Voltage ($R_{g1} = 2.2 \text{ M}\Omega$)	... ...	... ...	... ...	... ...	... ...	0 volts
Anode Current	... ...	... ...	... ...	... ...	... ...	550 μA
Screen Current	... ...	... ...	... ...	... ...	... ...	200 μA
Mutual Conductance	... ...	... ...	... ...	... ...	... ...	730 μA/V
Anode Impedance	... ...	... ...	... ...	... ...	... ...	0.5 MΩ
Grid 1 Voltage for $g_m = 10 \mu\text{A}/\text{V}$ ($V_{gs} = 0$)	... ...	... ...	... ...	... ...	... ...	-5.2 volts approx.
Grid 3 Voltage for $g_m = 10 \mu\text{A}/\text{V}$ ($V_{gs} = 0, R_{g1} = 2.2 \text{ M}\Omega$)	... ...	... ...	... ...	... ...	... ...	-3.7 volts approx.

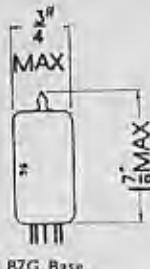
* g_m connected to cathode.

INTER-ELECTRODE CAPACITANCES

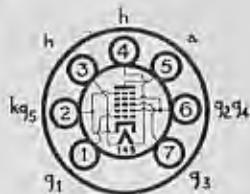
	With external screen	Without external screen
Input	4.3 pF
Output	5.0 pF
Anode to Grid	0.004 pF
		0.005 pF



Current Equipment Type



TYPE 12AD6
MINIATURE
HEPTODE
FREQUENCY
CHANGER



B7G Base

The BRIMAR 12AD6 is a miniature frequency changer for use in car radio receivers to operate directly from the 12-volt battery without the use of a vibrator H.T. system. It is designed to operate over the range of voltage variations normally encountered with car batteries.

RATINGS

Heater Voltage ...	12.6 volts
Heater Current ...	0.15 amp.
Anode Voltage ...	30 volts max.
Screen Grid (g_2, g_4) Voltage ...	30 volts max.
Screen Grid Supply Voltage ...	30 volts max.
Negative Control Grid (g_5) Voltage ...	-30 volts max.
Positive Control Grid Voltage ...	0 volts max.
Control Grid Circuit Resistance ...	10 megohms max.
Cathode Current ...	20 mA max.
Heater-Cathode Voltage ...	±30 volts max.

STATIC CHARACTERISTICS—OSCILLATOR SECTION

Measured with grids 2 and 4 connected to anode

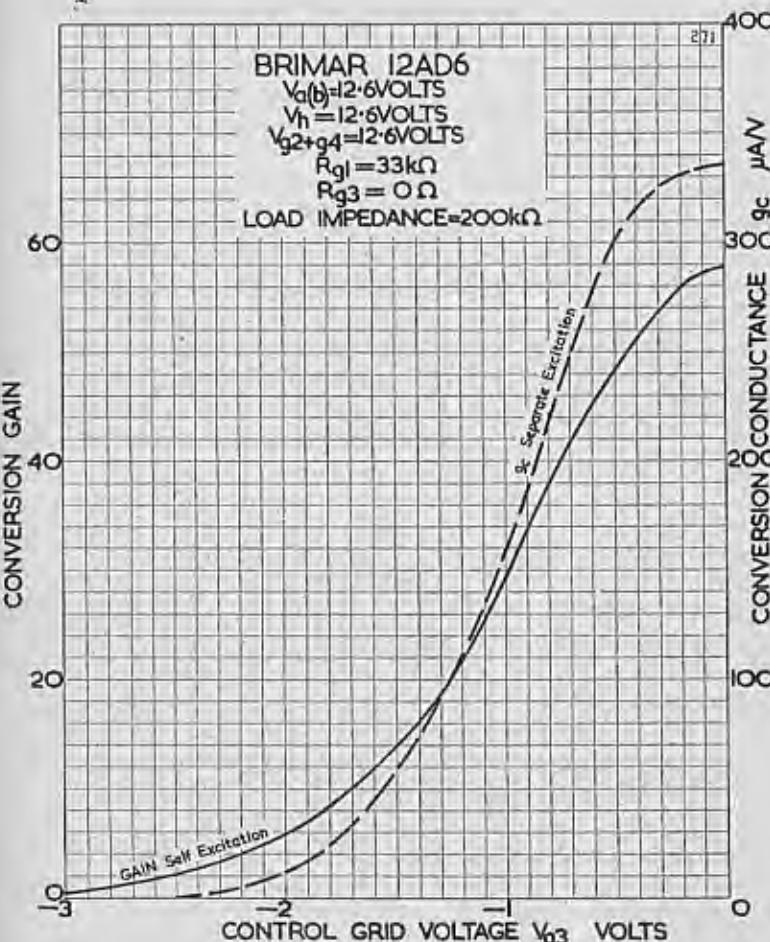
Anode, g_5 and g_4 Voltage ...	12.6 volts
Control Grid (g_1) Voltage ...	0 volts
Oscillator Grid (g_3) Voltage ...	0 volts
Mutual Conductance (g_1 to $g_3 + g_4 + a$) ...	3.8 mA/V
Amplification Factor (g_1 to $g_3 + g_4 + a$) ...	9
Cathode Current ...	5 mA.
Control Grid Voltage for $I_k = 10 \mu A$...	-4 volts

OPERATING CHARACTERISTICS AS A SELF EXCITED MIXER

Anode Voltage ...	12.6 volts
Screen Grid (g_2, g_4) Voltage ...	12.6 volts
Control Grid (g_1) Voltage ...	0 volts
Control Grid Resistance ...	3.2 megohms
Oscillator Grid (g_3) Resistance ...	33 kilohms
Oscillatory Voltage on Oscillator Grid ...	1.6 volts r.m.s.
Oscillator Grid Current ...	50 μA
Anode Current ...	450 μA
Screen Grid Current ...	1.5 mA
Cathode Current ...	2 mA
Conversion Conductance ...	260 $\mu A/V$
Control Grid Voltage for $g_2 = 5 \mu A/V$...	-2.2 volts approx.
Control Grid Voltage for $g_2 = 20 \mu A/V$...	-1.8 volts approx.

INTER-ELECTRODE CAPACITANCES

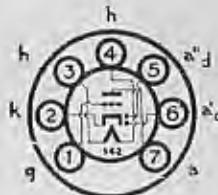
	With external screen	Without external screen
Control Grid to Anode (g_3 to a) ...	0.25	0.30 pF max.
Control Grid to Oscillator Grid (g_1 to g_3) ...	0.15	0.15 pF max.
R.F. Input (g_1 to all) ...	0.0	0.0 pF
Oscillator Input (g_1 to all) ...	5.5	5.5 pF
Mixer Output (a to all) ...	13.0	9.0 pF
Oscillator Grid to Cathode (g_3 to $k + g_4$) ...	3.0	3.0 pF
Oscillator Output (k to all except g_1) ...	20.0	15.0 pF
Oscillator Grid to Anode (g_3 to a) ...	0.05	0.1 pF





Current Equipment Type

TYPE 12AE6
MINIATURE
DOUBLE
DIODE TRIODE



B7G Base

The BRIMAR 12AE6 is a double diode triode for use in detector, A.V.C. and A.F. amplifier circuits of car radio receivers and is intended to operate directly from the 12-volt battery without the use of a vibrator H.T. system. It is designed to operate over the range of voltage variations normally encountered with car batteries.

RATINGS

Heater Voltage	...	...	...	...	...	...	12.6 volts
Heater Current	...	...	...	...	...	...	0.15 amp.
Anode Voltage	...	...	...	...	...	...	30 volts max.
Grid Circuit Resistance	...	...	...	...	...	...	10 MΩ max.
Cathode Current	...	...	...	...	...	...	20 mA max.
Diode Current (Average)	...	...	...	...	...	...	1 mA max.
Heater-Cathode Voltage	...	...	...	...	...	...	±30 volts max.

OPERATING CHARACTERISTICS

Anode Voltage	...	...	...	...	...	...	12.6 volts
Grid Voltage	...	...	...	...	...	...	0 volts
Anode Current	...	...	...	...	...	...	750 μA
Mutual Conductance	...	...	...	...	...	...	1 mA/V
Anode Impedance	...	...	...	...	...	...	15 kilohms
Amplification Factor	...	...	...	...	...	...	15

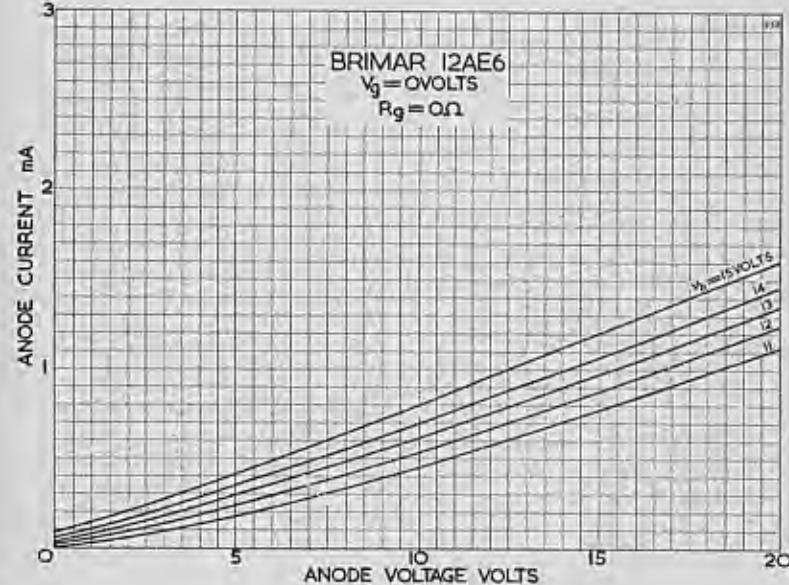
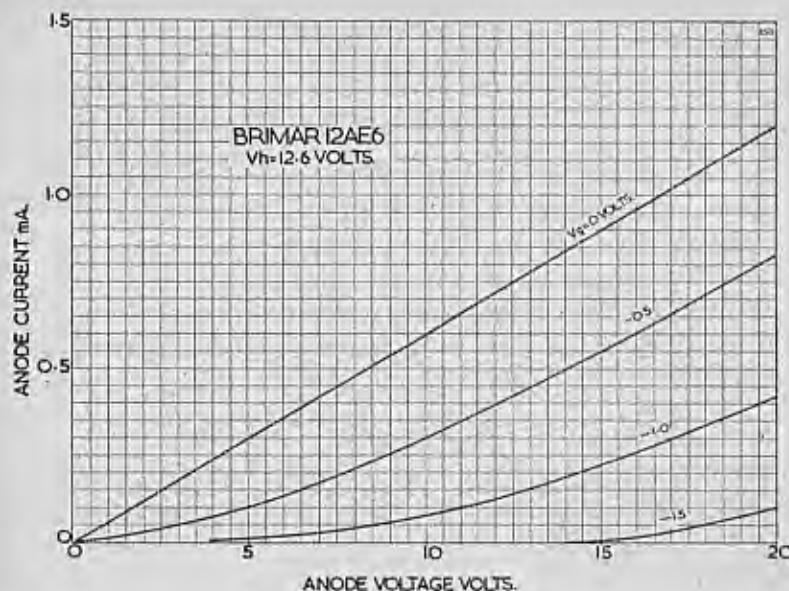
OPERATION AS AN R.C. COUPLED AMPLIFIER

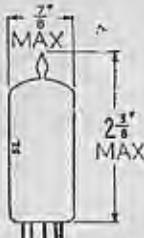
Anode Supply Voltage	...	...	...	...	...	...	14.4 volts
Grid Voltage	...	...	...	...	...	...	0 volts
Anode Load Resistor	...	...	...	...	...	...	470 KΩ
Grid Resistor	...	...	...	...	...	...	2.2 MΩ
Input Grid Coupling Capacitor	...	...	...	...	...	...	0.01 μF
Grid Resistor of following Stage	...	...	...	...	...	...	2.2 MΩ
Signal Source Impedance	...	...	...	...	...	...	1,000 Ω max.
Voltage Gain	...	...	...	...	...	...	10

INTER-ELECTRODE CAPACITANCES*

Input	...	...	...	...	...	...	1.5 pF
Output	...	...	...	...	...	...	1.1 pF
Anode to Grid	...	...	...	...	...	...	2.0 pF
Diode Anode to Diode Anode	...	...	...	...	...	...	0.9 pF

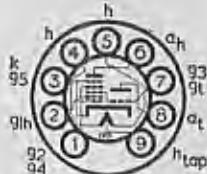
* Measured without external screen.





Current Equipment Type

TYPE 12AH8
MINIATURE
TRIODE-HEPTODE
FREQUENCY CHANGER



B9A (Noval) Base

The BRIMAR 12AH8 is a triode-heptode frequency changer on the Noval (B9A) base, featuring high conversion conductance, conversion impedance and oscillator mutual conductance. The centre tapped heater permits operation from either 6.3 or 12.6 volts, enabling the same valve to be used in both A.C. and A.C./D.C. equipment.

RATINGS

Heater Voltage	...	...	...	...	...	6.3	or	12.6 volts
Heater Current	...	...	...	...	...	0.3	0.15 amp.	
Heptode Anode Voltage	...	...	...	...	...	300	volts max.	
Heptode Screen (g_2 , a_2) Voltage	...	...	...	...	...	125	volts max.	
Triode Anode Voltage	...	...	...	...	...	150	volts max.	
Total Cathode Current	...	...	...	...	...	17.5	mA max.	

OPERATING CHARACTERISTICS

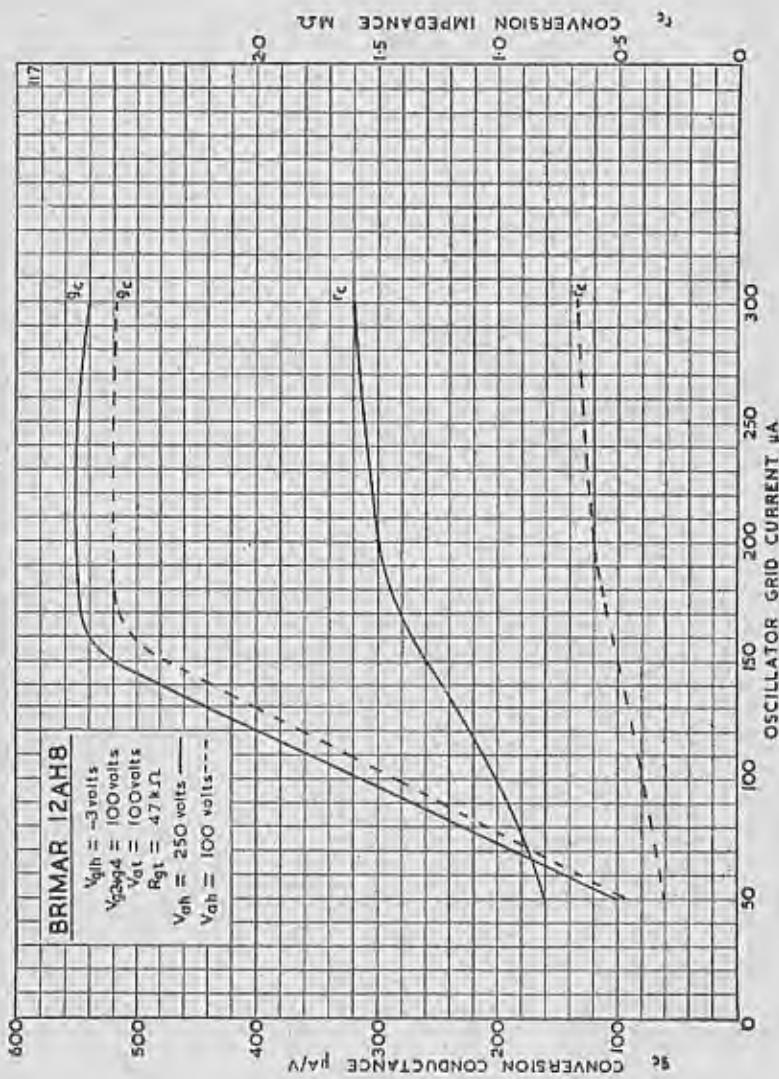
Heptode Anode Voltage	...	100	250	volts
Heptode Anode Current	...	2.5	2.6	mA
Heptode Screen Voltage	...	100	100	volts
Heptode Screen Current	...	4.5	4.4	mA
Signal Grid (g_1) Voltage	...	-3	-3	volts
Cathode Bias Resistor	...	220	220	ohms
Heptode Anode Impedance	...	0.6	1.5	meg.
Triode Anode Supply Voltage	...	100	250	volts
Triode Anode Resistor	...	0	27,000	ohms
Triode Anode Voltage	...	100	100	volts
Triode Anode Current	...	5.7	5.7	mA
Triode Grid Current	...	0.2	0.2	mA
Triode Grid Resistor	...	47	47	kilohms
Conversion Conductance	...	0.52	0.55	mA/V
Conversion Conductance for $V_{g1} = 22$ volts	0.005	0.005	mA/V	
Equivalent Noise Resistance	...	100,000	100,000	ohms approx.
*Triode Mutual Conductance	...	3.5	3.5	mA/V
*Triode Amplification Factor	...	17	17	

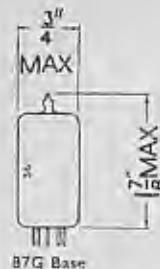
* Taken at $V_{g1} = 100$ v., $V_{g2} = 0$ v.

INTER-ELECTRODE CAPACITANCES

(with external close fitting shield)

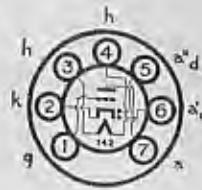
R.F. Input (g_{1h} -all)	...	...	...	...	...	5.0	pF
I.F. Output (a_{2h} -all)	...	...	...	...	...	8.0	pF
Triode Input	...	...	...	...	...	7.0	pF
Triode Output	...	...	...	...	...	2.5	pF
Heptode Grid to Heptode Anode (g_{1h} - a_h)	...	...	...	...	...	0.025	pF
Triode Grid to Triode Anode (g_1 - a_1)	...	...	...	...	...	1.2	pF





Current Equipment Type

TYPE 12AT6
MINIATURE
DOUBLE DIODE
TRIODE



RATINGS

Heater Voltage	...	...	...	...	...	12.6 volts
Heater Current	...	...	...	...	...	0.15 amp.
Anode Voltage	...	...	...	...	...	300 volts max.
Diode Current	...	...	...	...	...	1.0 mA max.

OPERATING CHARACTERISTICS

Anode Voltage	...	...	...	...	...	250 volts
Anode Current	...	...	...	...	...	1.0 mA
Grid Voltage	...	...	...	...	...	-3 volts
Anode Impedance	...	...	...	...	...	58,000 ohms
Mutual Conductance	...	...	...	...	...	1.2 mA/V
Amplification Factor	...	...	...	...	...	70

OPERATION AS RESISTANCE COUPLED AMPLIFIER

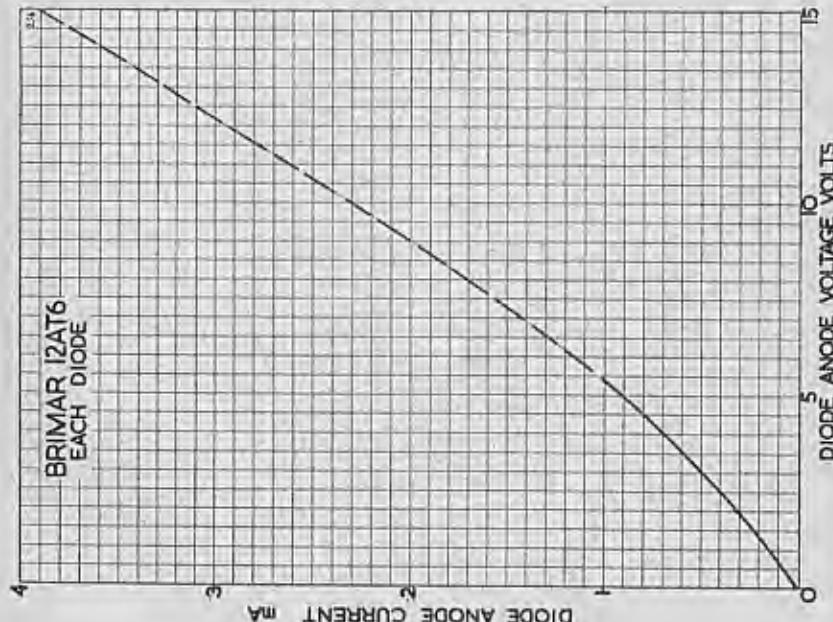
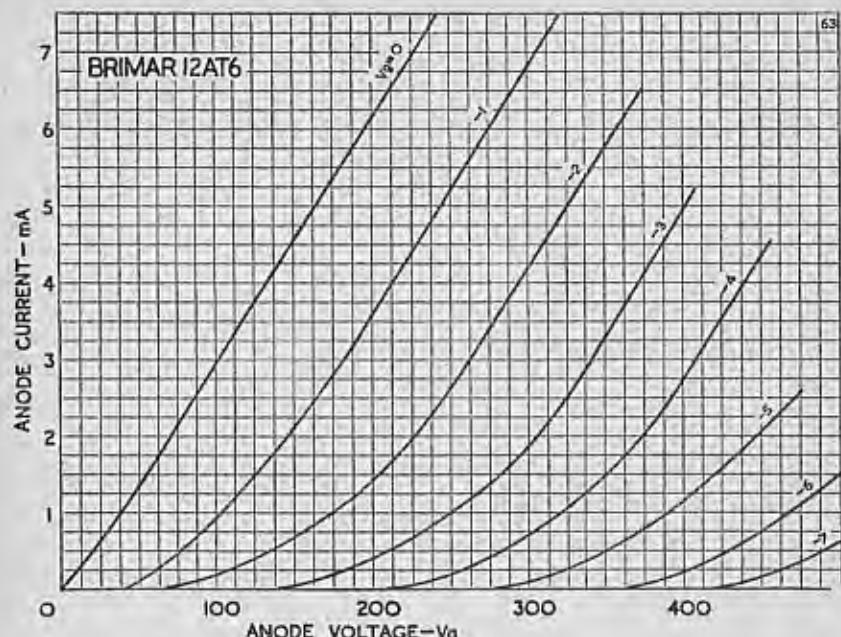
	100	250	250	volts
Anode Supply Voltage	0.5
Anode Load Resistor	0.25	0.25 meg.
Grid Resistor	1.0	1.0 meg.
Cathode Bias Resistor	...	9,000	3,000	0 ohms
Peak Output	...	16	43	40 volts
*Stage Gain	...	33	42	42
*Harmonic Distortion	...	2	1	5 per cent.

*Figures are for 12 volts peak output.

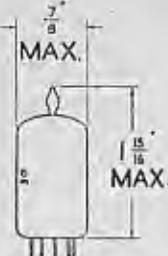
INTER-ELECTRODE CAPACITANCES †

Grid to Cathode	...	...	...	...	...	2.3 pF
Anode to Cathode	...	...	...	...	...	1.1 pF
Grid to Anode	...	...	...	...	...	2.1 pF
Diode Anode (a'') to Grid	...	...	...	...	...	0.025 pF max.

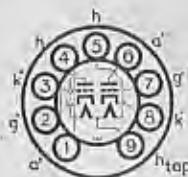
† With no external shield.



Current Equipment Type



TYPE 12AT7
MINIATURE
HIGH SLOPE
DOUBLE TRIODE



69A (Noval) Base

The separate cathode connections and tapped heater features enable the 12AT7 to be used in a variety of applications. As a frequency changer it will operate at frequencies up to 500 Mc/s.

RATINGS

Heater Voltage	6.3	or	12.6 volts
Heater Current	0.3	amp	0.15 amp
Anode Voltage	300	volts max	
Anode Dissipation (each section)	2.5	watts max	
D.C. Cathode Current (each section)	20	mA. max	
Anode Voltage (zero Anode Current)	550	volts max	

OPERATING CHARACTERISTICS

	(Each Section, Class A)			
Anode Voltage	100	180	250	volts
Anode Current	3.7	11.0	10.0	mA
Grid Voltage	-1	-1	-2	volts
Anode Impedance	13,500	9,400	10,000	ohms
Mutual Conductance	4.0	6.6	5.5	mA/V
Amplification Factor	54	62	55	
Grid Voltage	-6	-8	-12	volts
(for Anode Current cut-off)				

OPERATION AS FREQUENCY CHANGER

OSCILLATOR SECTION

Anode Supply Voltage	250	volts
Anode Decoupling Resistor	1,000	ohms
Grid Resistor	10,000	ohms

MIXER SECTION

Anode Supply Voltage	250	volts
Anode Decoupling Resistor	1,000	ohms
Cathode Bias Resistor	680	ohms
* Conversion Conductance	2.5	mA/V
† Heterodyne Voltage	(See note)	

* Exact value depends on circuit constants and input impedance considerations.

† Heterodyne voltage should be just less than that required to cause grid current in the mixer section.

INTER-ELECTRODE CAPACITANCES *

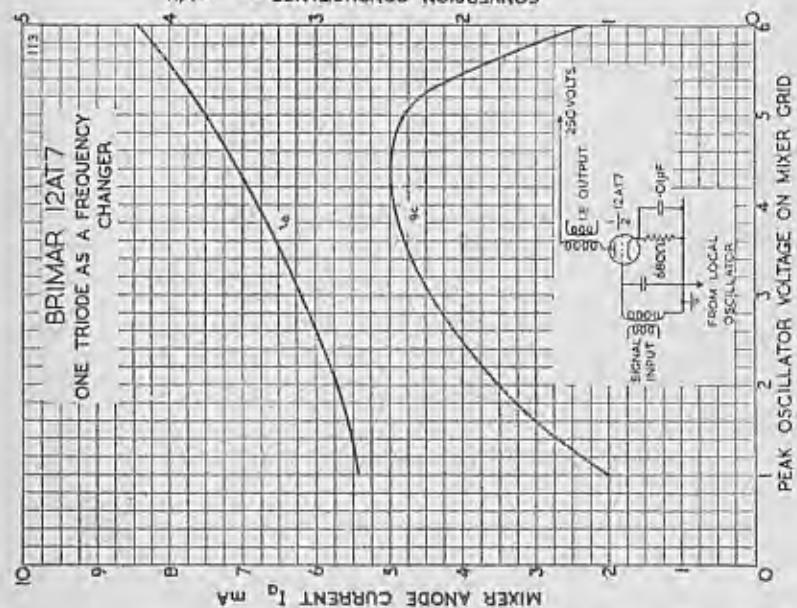
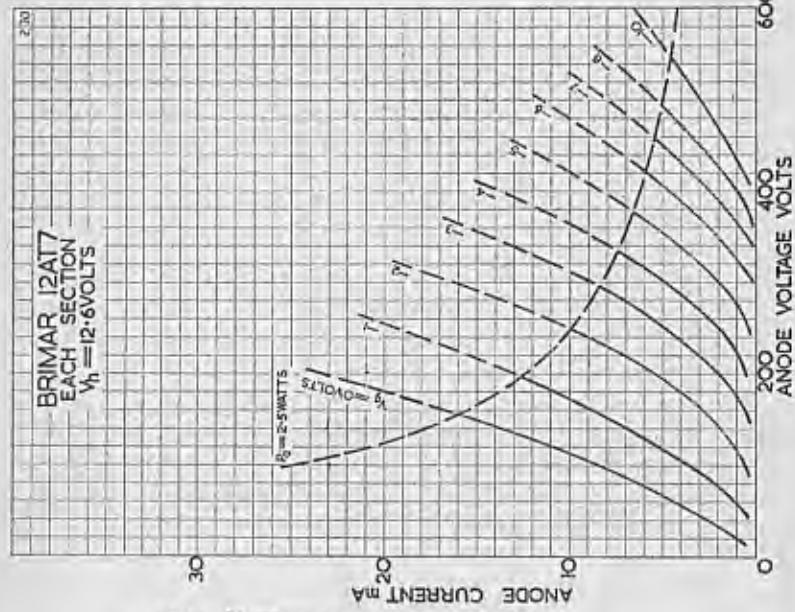
Grid to Grid	0.005	pF max.
Anode to Anode	0.4	pF max.

EACH SECTION

Input	2.5	pF
Output	0.4	pF
Grid to Anode	1.5	pF
Cathode to Heater	2.5	pF

* Measured with no external shield.

Type 12AT7 is a commercial equivalent of the CV455.



Current Equipment Type



TYPE 12AU6
MINIATURE
HIGH SLOPE
R.F. PENTODE



Type 12AU6 is a sharp cut-off pentode suitable for use as R.F. or A.F. amplifier limiter or sync. separator.

RATINGS

Heater Voltage	...	...	...	...	...	...	12.6 volts
Heater Current	...	...	...	...	...	...	0.15 amp.
Anode Voltage	...	...	...	...	...	...	300 volts max.
Anode Dissipation	...	...	...	...	...	...	3.0 watts max.
Screen (g_2) Supply Voltage	...	...	...	...	...	...	300 volts max.
Screen (g_2) Voltage	...	...	...	...	...	...	150 volts max.
Screen Dissipation	...	...	...	...	...	...	0.65 watts max.

OPERATING CHARACTERISTICS

(Suppressor Grid (g_3) connected to Cathode)

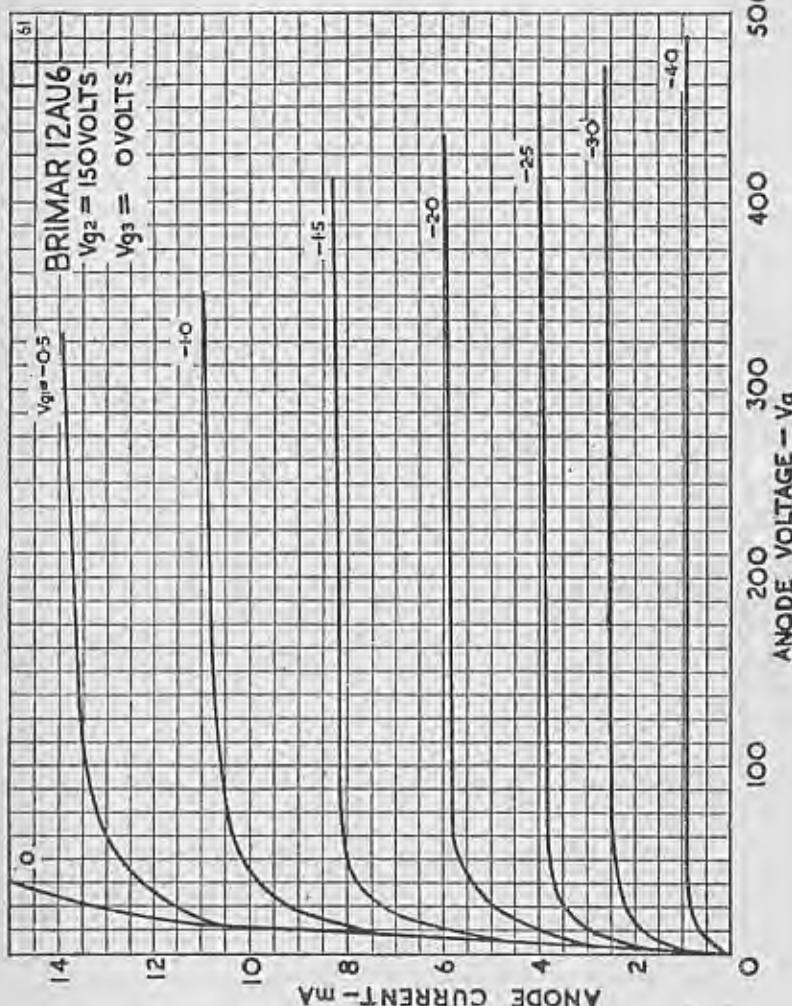
Anode Voltage	...	...	...	250	250	100	volts
Anode Current	...	...	...	10.8	7.6	5.2	mA
Screen Voltage	...	...	...	150	125	100	volts
Screen Current	...	...	...	4.3	3.0	2.0	mA
Control Grid (g_1) Voltage	...	...	-1	-1	-1	-1	volts
Cathode Bias Resistor	...	...	68	100	140	140	ohms
Anode Impedance	...	...	1.0	1.5	0.5	0.5	meg.
Mutual Conductance	...	...	5.2	4.4	3.9	3.9	mA/V
Inner Amplification Factor (μ_{g_1, g_2})	...	41	41	41	41	41	
Input Impedance (50 Mc/s)	...	3,500	—	—	—	—	ohms
Input Impedance (90 Mc/s)	...	900	—	—	—	—	ohms
Control Grid Voltage	...	-6.2	-5.2	-4.2	-4.2	-4.2	volts

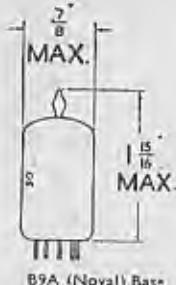
(For Anode Current Cut-off).

INTER-ELECTRODE CAPACITANCES *

Input	...	...	...	...	...	...	5.5 pF
Output	...	...	...	...	...	...	5.0 pF
Grid to Anode	...	...	...	...	...	...	0.0035 pF max.

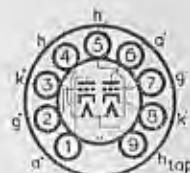
* With no external shield.





Current Equipment Type

TYPE 12AU7
MINIATURE
DOUBLE TRIODE
(LOW-MU)



B9A (Noval) Base

RATINGS

Heater Voltage	6.3	12.6	volts
Heater Current	0.3	0.15	amp.
Anode Voltage	300	volts max.	
Anode Dissipation (per section)	2.75	watts max.	
Cathode Current (per section)	20	mA max.	
Anode Voltage (zero Anode Current)	550	volts max.	

OPERATING CHARACTERISTICS

Anode Voltage	100	250	volts
Anode Current	11.8	10.5	mA
Grid Voltage	0	-8.5	volts
Anode Impedance	6,250	7,700	ohms
Mutual Conductance	3.1	2.2	mA/V
Amplification Factor	19	17	

OPERATION AS RESISTANCE COUPLED AMPLIFIER

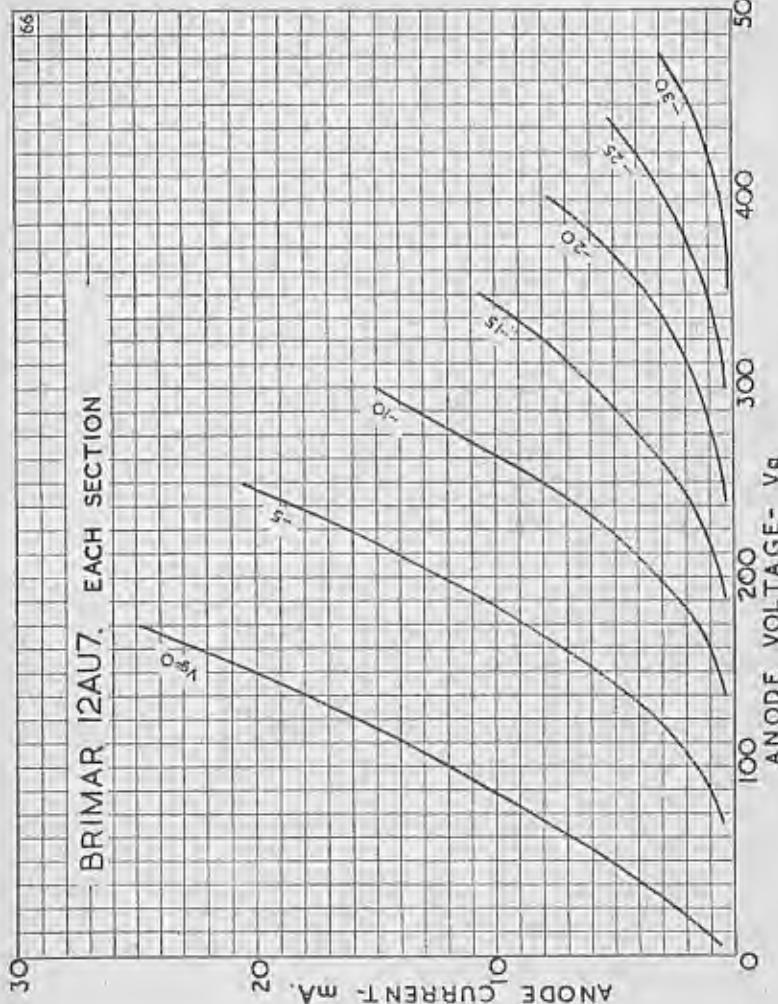
Anode Supply Voltage	100	250	volts
Anode Load Resistor	0.1	0.1	meg.
Cathode Bias Resistor	4,000	3,000	ohms
Peak Output	17	50	volts
Stage Gain	11	12	

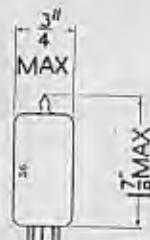
INTER-ELECTRODE CAPACITANCES*

	Section 1	Section 2
Input	1.6	1.6 pF
Output	0.5	0.35 pF
Grid to Anode	1.5	1.5 pF

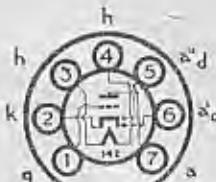
* With no external shield.

Type 12AU7 is a commercial equivalent of the CV401.





Maintenance Type
TYPE 12AV6
DOUBLE DIODE
TRIODE



The BRIMAR 12AV6 is a miniature double diode triode for use in A.M. receivers for signal detection, A.G.C. and A.F. amplification.

RATINGS

Heater Voltage	...	...	...	...	...	12.6	volts
Heater Current	...	...	...	...	...	0.15	amps
Anode Voltage	...	...	...	...	...	300	volts max.
Anode Dissipation	...	...	...	...	...	1	watt max.
Diode Anode Current	...	...	...	...	...	1	mA max.

OPERATING CHARACTERISTICS (Triode Section)

Anode Voltage	...	...	...	...	100	250	volts
Grid Voltage	...	...	...	...	-1	-2	volts
Anode Current	...	...	...	...	0.5	1.2	mA
Mutual Conductance	...	...	...	...	1.25	1.6	mA/V
Amplification Factor	...	...	...	...	100	100	
Anode Resistance	...	...	...	...	80	62.5	k ohms

OPERATION AS AN R.C. COUPLED AMPLIFIER

Anode Supply Voltage	...	...	...	...	100	250	volts
Anode Resistor	...	...	...	...	220	220	k ohms
Cathode Resistor	...	...	...	...	8.2	3.3	k ohms
Gain	...	...	...	...	45	62	
Peak Output Voltage	...	...	...	...	10	50	volts

INTER-ELECTRODE CAPACITANCES

Triode Input	...	...	...	...	...	2.3	pF
Triode Output	...	...	...	...	...	1.1	pF
Triode Grid to Triode Anode	...	...	...	...	...	2.1	pF
Diode Anode to Grid	...	...	...	...	...	0.025	pF max.

Current Equipment Type

TYPE 12AX7

MINIATURE
DOUBLE TRIODE
(HIGH-MU)



B9A (Novel) Base

RATINGS

Heater Voltage	...	...	...	...	...	6.3	or	12.6	volts
Heater Current	...	...	...	...	...	0.3	or	0.15	amps
Anode Voltage	...	...	...	...	...	...	...	300	volts max.
Anode Dissipation	...	...	...	...	...	...	...	1.0	watts max.
Anode Voltage (Zero Anode Current)	...	...	...	...	...	...	...	550	volts max.

OPERATING CHARACTERISTICS (Each Section)

Anode Voltage	...	...	...	...	...	100	250	volts
Anode Current	...	...	...	...	...	0.5	1.2	mA
Grid Voltage	...	...	...	...	...	—	—2	volts
Anode Impedance	...	...	...	...	...	80,000	62,500	ohms
Mutual Conductance	...	...	...	...	...	1.25	1.6	mA/V
Amplification Factor	...	...	...	...	...	100	100	

OPERATION AS RESISTANCE COUPLED AMPLIFIER

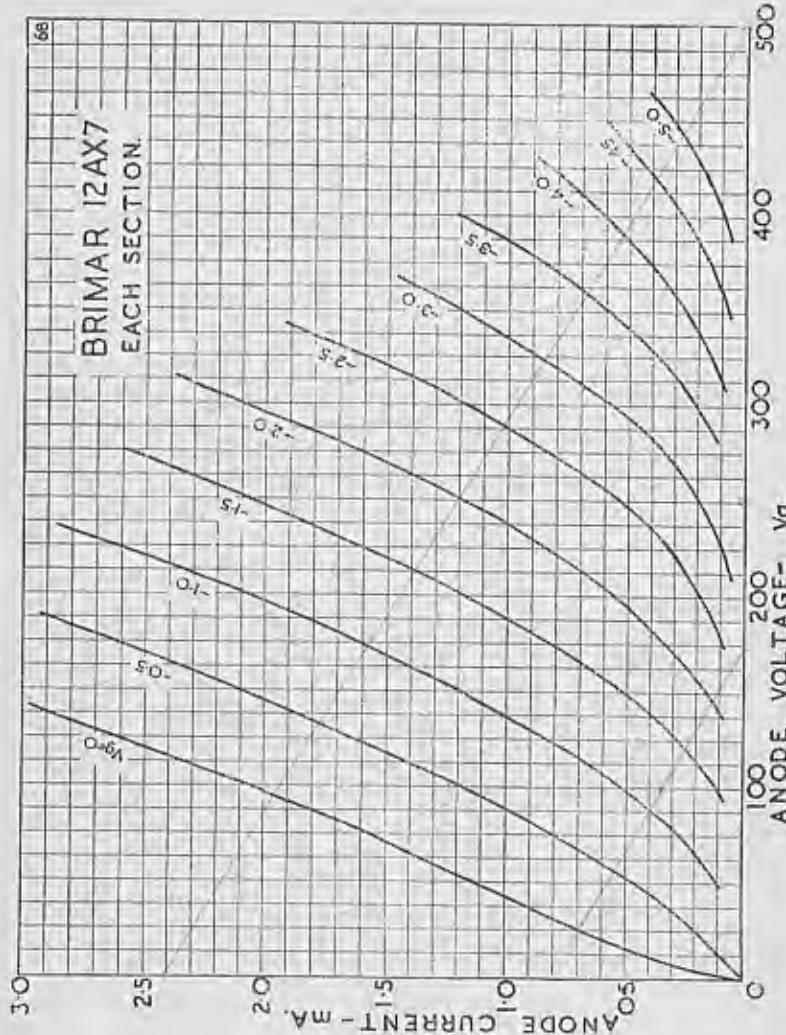
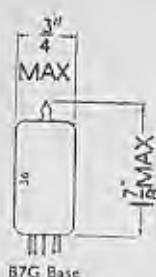
Anode Supply Voltage	...	...	...	...	...	100	250	volts
Anode Load Resistor	...	...	...	...	...	0.25	0.25	meg.
Cathode Bias Resistor	...	...	...	...	...	6,500	3,000	ohms
Peak Output	...	...	...	...	...	10	50	volts
Stage Gain	...	...	...	...	...	45	60	

INTER-ELECTRODE CAPACITANCES *

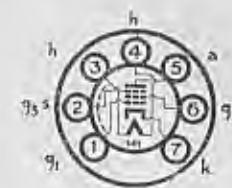
	Section 1	Section 2
Input
Output
Grid to Anode

* With no external shield.

Type 12AX7 is a commercial equivalent of the CV492.

**Current Equipment Type**

TYPE 12BA6
MINIATURE
HIGH SLOPE
VARI-MU
R.F. PENTODE

**RATINGS**

Heater Voltage	...	...	...	...	...	...	...	12.6 volts
Heater Current	...	...	...	...	...	...	...	0.15 amp.
Anode Voltage	...	...	...	...	...	...	...	300 volts max.
Anode Dissipation	...	...	...	...	...	...	...	3.0 watts max.
Screen (g_2) Supply Voltage	...	...	...	...	...	...	...	300 volts max.
Screen Voltage	...	...	...	...	...	...	...	125 volts max.
Screen Dissipation	...	...	...	...	...	...	...	0.6 watt max.

OPERATING CHARACTERISTICS
(Suppressor Grid (g_3) connected to Cathode)

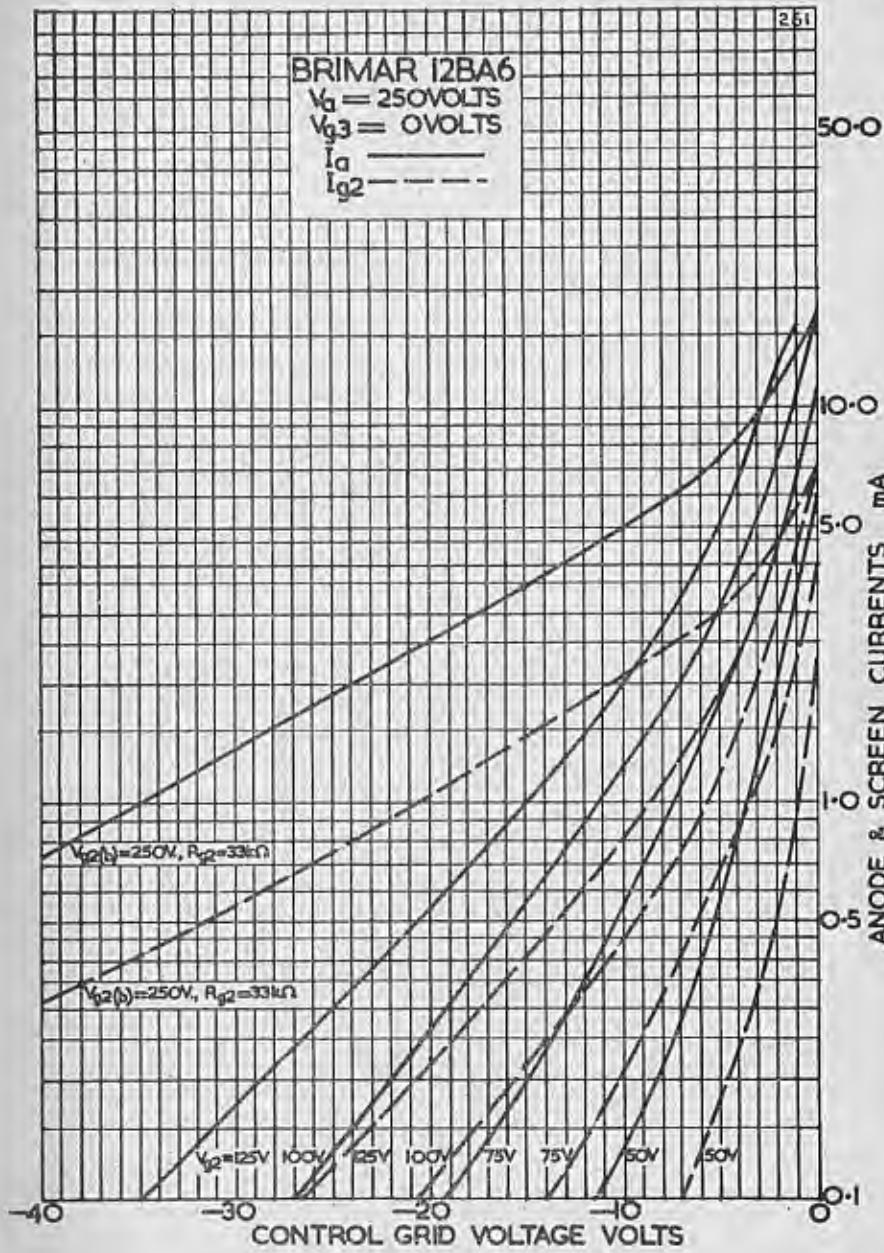
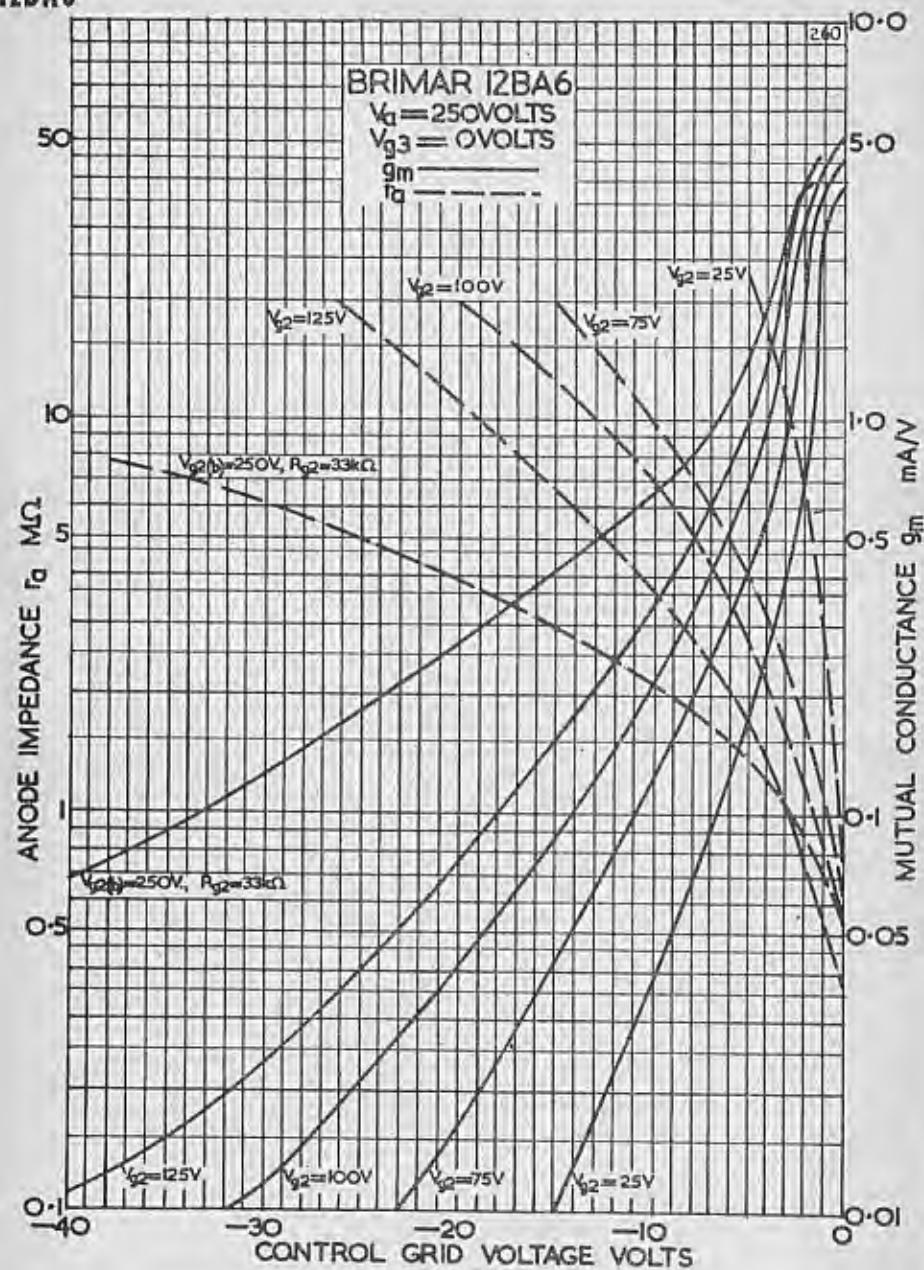
Anode Voltage	...	...	...	100	250	250	volts
Anode Current	...	...	...	10.8	11.0	11.0	mA
Screen Voltage	...	...	...	100	100	—	volts
Series Screen Resistor	...	...	...	—	—	—	33,000 ohms
Screen Current	...	...	...	4.4	4.2	4.2	mA
Control Grid (g_1) Voltage	...	...	...	-1	-1	-1	volts
Cathode Bias Resistor	...	...	...	68	68	68	ohms
Anode Impedance	...	...	...	0.25	1.5	1.5	meg.
Mutual Conductance	...	...	...	4.3	4.4	4.4	mA/V
Input Impedance (45 Mc/s)	...	...	...	4,500	4,500	4,500	ohms
Input Impedance (90 Mc/s)	...	...	...	900	900	900	ohms
Control Grid Voltage	...	...	...	-21	-21	-21	volts

(For Mutual Conductance of 0.005 mA/V).

INTER-ELECTRODE CAPACITANCES*

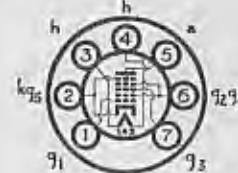
Input	...	...	...	...	...	...	...	5.5 pF
Output	...	...	...	...	...	...	...	5.0 pF
Grid to Anode	...	...	...	...	...	...	...	0.0035 pF max.

* With no external shield.



**Current Equipment Type****TYPE 12BE6**

MINIATURE
HEPTODE
FREQUENCY
CHANGER



Owing to its specialized structure, type 12BE6 may be employed as a self-oscillating frequency changer at frequencies exceeding 60 Mc/s, with excellent frequency stability.

RATINGS

Heater Voltage	...	...	...	...	...	...	12.6 volts
Heater Current	...	...	...	...	...	...	0.15 amp.
Anode Voltage	...	...	...	...	...	...	300 volts max.
Anode Dissipation	...	...	...	...	...	...	1.0 watt max.
Screen (g_2, g_3) Voltage	...	...	...	...	...	...	100 volts max.
Screen Dissipation	...	...	...	...	...	...	1.0 watt max.
Total Cathode Current	...	...	...	...	...	...	14 mA max.

OPERATING CHARACTERISTICS (SEPARATE EXCITATION)

Anode Voltage	...	...	...	...	...	...	250 volts
Anode Current	...	...	...	...	...	...	3.0 mA
Screen Voltage	...	...	...	...	...	...	100 volts
Screen Current	...	...	...	...	...	...	7.1 mA
Control Grid (g_1) Voltage	...	...	...	...	...	...	-1.5 volts
Anode Impedance	...	...	...	...	...	...	1.0 meg.
Oscillator Grid (g_2) Current	...	...	...	...	...	...	0.5 mA
Oscillator Grid Resistor	...	...	...	...	...	...	20,000 ohms
Oscillator Mutual Conductance	...	...	...	...	...	...	7.25 mA/V
Conversion Conductance	...	...	...	...	...	...	0.475 mA/V†
Control Grid Voltage	...	...	...	...	...	...	-30 volts

(For Conversion Conductance of 0.005 mA/V).

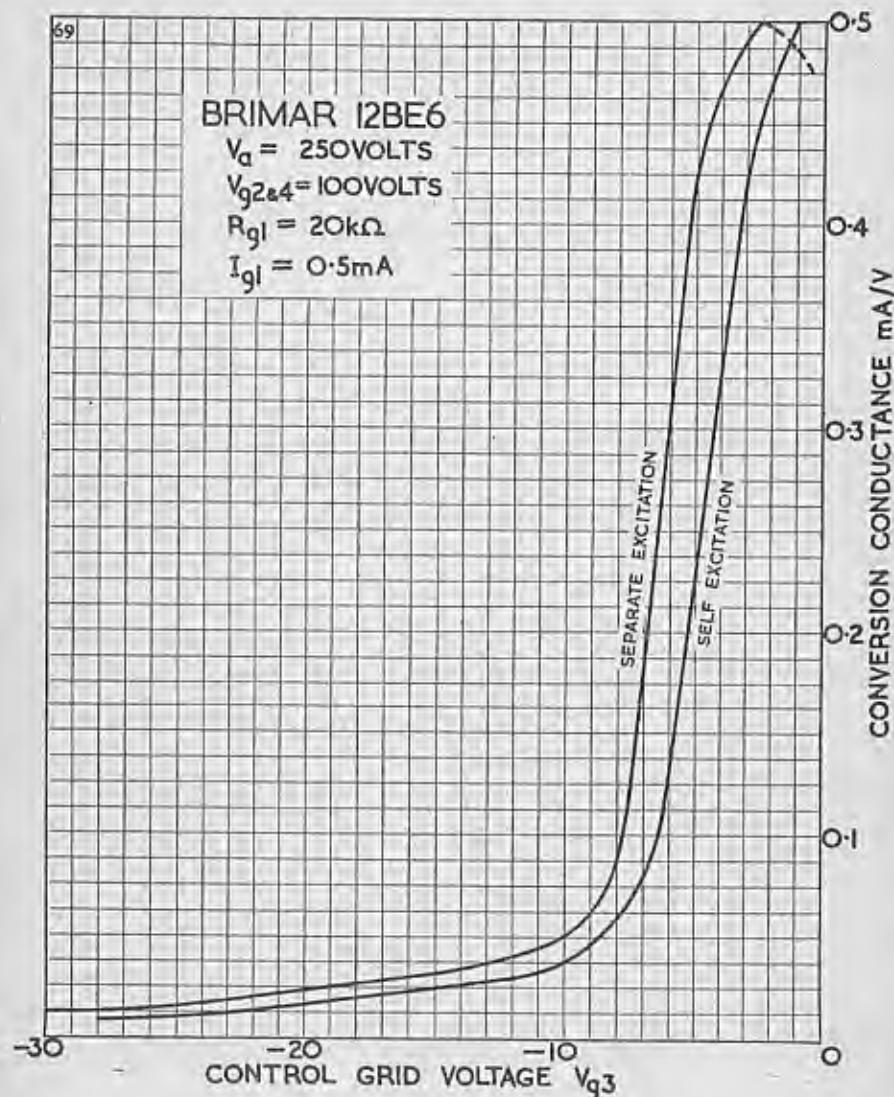
† When used with self excitation this value depends on the position of the cathode tap up the coil.

INTER-ELECTRODE CAPACITANCES *

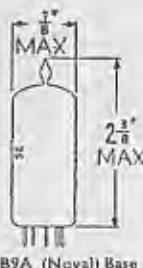
R.F. Input	...	...	...	...	...	...	7.2 pF
I.F. Output	...	...	...	...	...	...	8.6 pF
Oscillator Input	...	...	...	...	...	...	5.5 pF
Control Grid to Anode	...	...	...	...	...	...	0.3 pF max.

* Measured with no external shield.

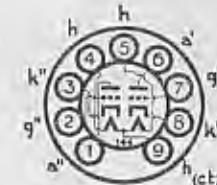
NOTE.—The characteristics shown with separate excitation approximate closely to those obtained with self excitation and zero bias.



Current Equipment Type



TYPE 12BH7
MINIATURE
DOUBLE TRIODE
(LOW-MU)



The BRIMAR type 12BH7 is a double triode with two independent low impedance units. It may be used in a variety of pulse, time-base and A.F. applications.

RATINGS

Heater Voltage	... ... ... ...	6.3	or	12.6 volts
Heater Current	... ... ... ...	0.6	or	0.3 amp.
Direct Anode Voltage as Field Scan Output Valve	... ...	500	volts max.	
Direct Anode Voltage as Class A Amplifier	... ...	300	volts max.	
Anode Dissipation, each section	... ...	3.5	watts max.	
Cathode Current, each section	... ...	20	mA max.	
*Peak Positive Pulse Anode Voltage	... ...	1,500	volts max.	
*Peak Negative Pulse Grid Voltage	... ...	220	volts max.	
Peak Cathode Current, each section	... ...	70	mA max.	

OPERATING CHARACTERISTICS
 (As Class A Amplifier, each section)

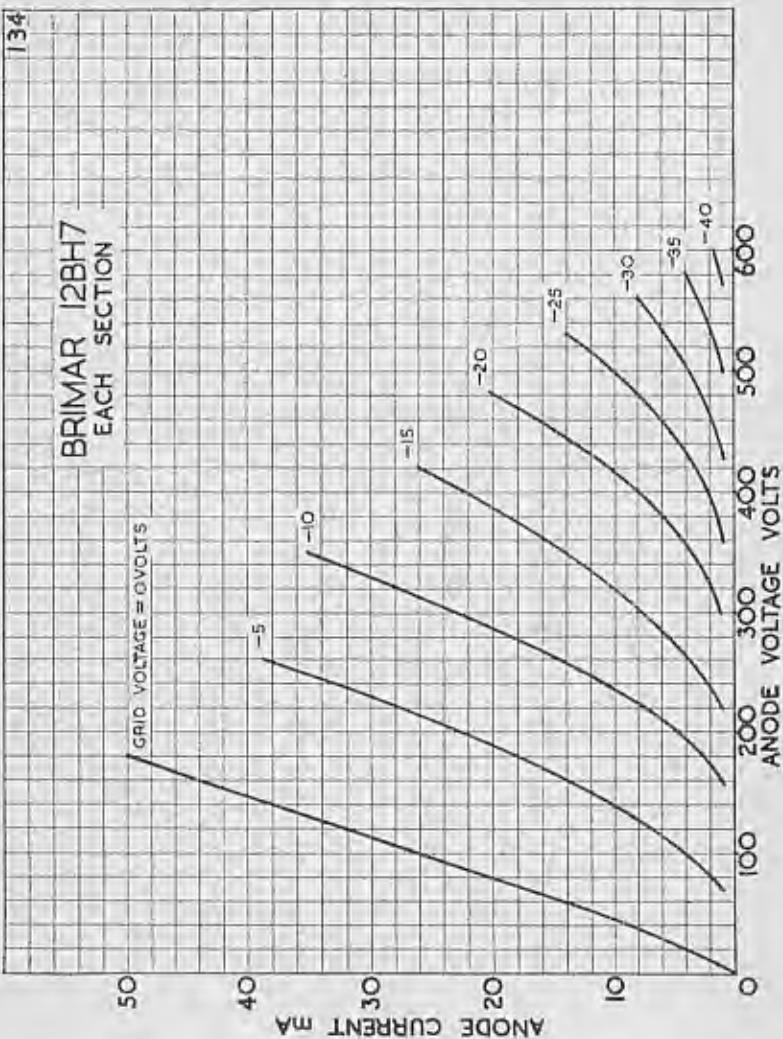
Anode Voltage	... ... ... ...	85	250	volts
Anode Current	... ... ... ...	20	11.5	mA
Grid Voltage	... ... ... ...	0	-10.5	volts
Mutual Conductance	... ... ... ...	6.2	3.1	mA/V
Amplification Factor	... ... ... ...	21	17	
Anode Impedance	... ... ... ...	3,400	5,500	ohms
Grid Voltage for Cut-off	... ... ... ...	-8	-20	volts

INTER-ELECTRODE CAPACITANCES†

Anode 1 to Anode 2 (C_{a1}, a_2)	... ... ... ...	0.9	pF
<i>Each Section:</i>			
Input (C_{in})	... ... ... ...	3.0	pF
Output (C_{out})	... ... ... ...	0.8	pF
Grid to Anode (C_{g1}, a_1)	... ... ... ...	2.4	pF

*The duty cycle must not exceed 15 per cent of the scanning cycle, and its duration must not exceed 3 milli-seconds. Ratings are absolute values.

† No external shield.



Current Equipment Type



TYPE 12BL6
MINIATURE
VARI-MU R.F. PENTODE



The BRIMAR 12BL6 is a miniature vari-mu R.F. pentode designed to operate directly from a nominal 12 volt car battery supply.

Heater Voltage	...	...	...	...	...	...	12.6	volts
Heater Current	...	...	...	...	...	...	0.15	amps

RATINGS

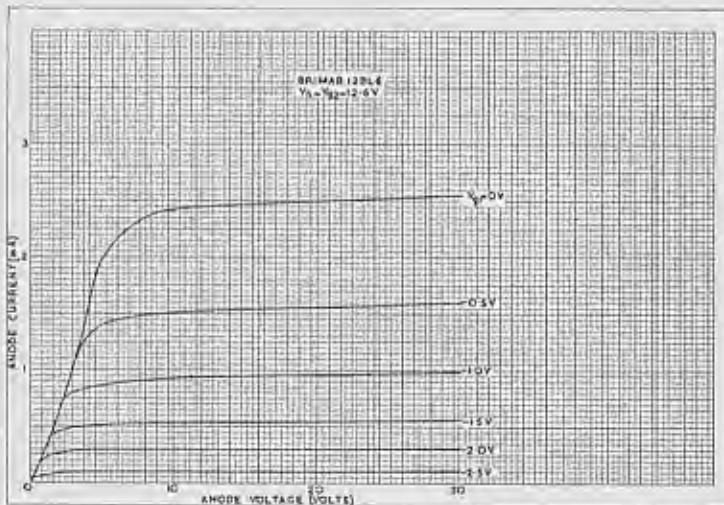
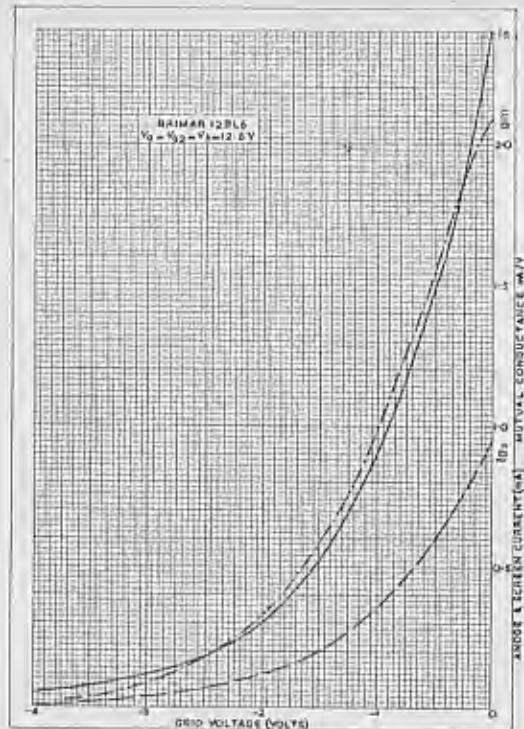
Max. Anode Voltage	...	...	...	...	...	30	volts
Max. Screen Voltage	...	...	...	...	...	30	volts
Max. Grid-Circuit Resistance	...	...	...	...	...	10	M. ohms

OPERATING CHARACTERISTICS

Anode Voltage	...	...	...	...	...	12.6	volts
Screen Voltage	...	...	...	...	...	12.6	volts
Control Grid Bias Voltage	...	...	...	...	...	0	volts
Grid-Circuit Resistance	...	...	...	...	...	2.2	M. ohms
Anode Current	...	...	...	...	...	1.4	mA
Screen Current	...	...	...	...	...	0.55	mA
Mutual Conductance	...	...	...	...	...	1.35	mA/V
Anode Impedance	...	...	...	...	...	0.5	M. ohms

DIRECT INTERELECTRODE CAPACITANCES
(Measured with External Shield)

C _{a-g₁}	...	...	...	...	...	...	0.005	pF max.
C _{in}	...	...	...	...	...	...	5.2	pF
C _{out}	...	...	...	...	...	...	5.4	pF



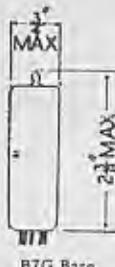
Maintenance Type

TYPE 12K5

MINIATURE

OUTPUT

TETRODE



The BRIMAR 12K5 is a miniature tetrode with a space charge grid, g₁, the control grid being g₂. The valve is intended for use as a driver stage in A.F. applications in car radio receivers and will operate directly from the 12-volt battery without the use of vibrator H.T. system. It is designed to operate over the range of voltage variation normally encountered with car batteries.

RATINGS

Heater Voltage	...	...	...	...	...	...	...	12.6 volts
Heater Current	...	...	...	...	...	...	...	0.45 amp.
Anode Voltage	...	...	...	...	...	...	...	30 volts max.
Control Grid (g ₂) Voltage	...	...	...	...	...	...	...	-20 volts max.
Control Grid Circuit Resistance	...	...	...	...	...	...	...	2.2 megohms max.
Space Charge Grid (g ₁) Voltage	...	...	...	...	...	...	...	16 volts abs. max.
Space Charge Grid Supply Voltage	...	...	...	...	...	...	...	30 volts max.
Heater-Cathode Voltage	± 30 volts max.

OPERATING CHARACTERISTICS

Anode Voltage	...	...	...	...	...	...	...	12.6 volts
Space Charge Grid Voltage	...	...	...	...	...	...	...	12.6 volts
Control Grid Voltage	...	...	...	...	...	...	...	-2 volts
Anode Current	...	...	...	...	...	...	...	8 mA
Space Charge Grid Current	...	...	...	...	...	...	...	85 mA
Mutual Conductance (g ₂ to a)	...	...	...	...	...	...	...	7 mA/V
Anode Impedance	...	...	...	...	...	...	...	800 ohms
Amplification Factor	...	...	...	...	...	...	...	5.6

TYPICAL OPERATION AS A DRIVER STAGE

Anode Voltage	...	...	...	...	...	...	...	12.6 volts
Space Charge Grid Voltage	...	...	...	...	...	...	...	12.6 volts
Control Grid Resistor *	...	...	...	...	...	...	...	2.2 megohms
Input Coupling Capacitor	...	...	...	...	...	...	...	0.1 μ F
Signal Source Impedance	...	...	...	...	...	...	...	100 K Ω
Optimum Load	...	...	...	...	...	...	...	800 ohms
Anode Current, no signal	...	...	...	...	...	...	...	35 mA
Anode Current, maximum signal	...	...	...	...	...	...	...	8 mA
Power Output	...	...	...	...	...	...	...	35 mW
Distortion	...	...	...	...	...	...	...	10 per cent.

* Bias is provided by grid current rectification.